Lessons on Decorative Design

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DEPARTMENT OF SCIENCE AND ART
OF THE COMMITTEE OF COUNCIL
ON EDUCATION.

SCIENCE CLASS.

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Awarded to Willie A. Tanner

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LESSONS ON DECORATIVE DESIGN.

DECORATIVE DESIGN

AN
ELEMENTARY
TEXT BOOK
— OF —
PRINCIPLES
— AND —
PRACTICE
— by —

FRANK G. JACKSON,
SECOND MASTER IN THE
BIRM.M MUNICIPAL SCHOOL OF ART

CHAPMAN & HALL L.D

1888

ART

NATURE

F.G. JACKSON.
DEL & INV.

LESSONS

ON

DECORATIVE DESIGN.

BY

FRANK G. JACKSON,

SECOND MASTER, BIRMINGHAM MUNICIPAL SCHOOL OF ART.

LONDON: CHAPMAN AND HALL,

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PREFACE.

THE want of inexpensive text-books on the subject of Decorative Design has long been felt both by students and teachers ; hence the present publication. Its object is to assist young students in their early decorative attempts by showing them the constructive origin of ornamentation, and to place before them such guiding principles and orderly methods as are found to underlie all true decoration of every kind. The contents of this handbook are based upon a course of lectures delivered at the Birmingham Municipal School of Art, but limited to the elementary section only, as it was thought best to reserve the more advanced for a subsequent manual. To have extended the present work beyond its elementary scope would have placed it out of the reach of many students to whom it is hoped it may be of service.

FRANK G. JACKSON.

May, 1888.

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LESSONS

ON

DECORATIVE DESIGN.

CHAPTER I.

INTRODUCTORY.

In beginning this series of lessons on Decorative Design, I am confronted with the oft-repeated question, Can design be taught? The answer will depend upon how the word is accepted. If by the use of the term design, pure invention is meant, then undoubtedly it cannot be taught; it is an impossibility. But if, on the other hand, simple composition or arrangement is implied, then it can be taught, for the laws that govern composition are capable of demonstration.

Design, in the highest acceptation of the term, and composition stand in the same relation to one another as poetry to versification. The former cannot be taught: the rules that regulate the latter can be taught. Hence, then, I set aside the impossible, and devote the following pages to the setting forth of what admits of demonstration. In the study of Decorative Art there are two books to be consulted: the Book of History, and the Book of Nature. These should be taken together, neither being neglected, for one explains the other. From the historical records of Art we gather the results of experience, and see the interpretation of natural laws. From Nature we get inspiration and material for our practice. If we disregard what has been already done, we must ever remain in artistic infancy; and again, if we close our eyes to the works of Nature, relying upon the treasures of the past, then our work will be retrogressive from the want of that vitality which the study of Nature alone can give.

Mr. Garbett, in his "Principles of Design in Architecture," says: "In the study of Nature, without which the architect as well as every other artist can do nothing

—absolutely nothing — he must also study the commentaries on her, *i.e.*, all previous productions of his art. All these are so many annotations on Nature's great and most difficult book; and he who attempts to read her without their assistance, simply sets up his wisdom against that of all mankind; and, however satisfactory his discoveries may be to himself, he may be assured that they are as old as Adam; and that should he have at once the greatest genius and the longest life ever granted, he will have advanced no further than the first efforts of the art, which, pursued on this principle, would (unlike all other human pursuits) be never beyond its beginning. It is impossible for the designer to produce anything *true* but by the study of Nature, and it is impossible to produce anything *new* but by a knowledge of what has been done by his predecessors. The most original artists of any kind are the most extensive imitators." Bearing on this point, Sir Joshua Reynolds in one of his discourses says: "The more extensive, therefore, your acquaintance is with the works of those who have excelled, the more extensive will be your

powers of invention, and what may appear still more like a paradox, the more original will be your conceptions." Many students early get hold of the notion that if the Art of the past is not studied by them, they can take up the practice of design with perfectly unbiassed minds, and therefore originality must follow. No greater error can exist. As an illustration of this, I may mention an instance that came under my notice. A student who was engaged upon a design for a fire-place, wishing to ensure originality, purposely avoided consulting Nature or any good works of art; with the result that the work was not original in any sense, and at best was but a poor and vague reproduction of many such objects that had passed before his eyes. By not systematically studying good examples he tried to avoid bias, never dreaming that he was daily being biassed by commonplaces around him. Had the student been modest enough to have patiently studied the best Art examples and to have learnt from the experiences of the great masters, the influence of bad examples would have been neutralised, his work would have taken at least the form

of a good reproduction instead of a bad one, and there would have been a great chance of its being original.

The study of Nature should be carried on almost simultaneously with the study of ancient Art. For no attempt to use the forms of ancient Art will be satisfactory unless a constant reference to Nature is made on the part of the student. Still less will he be able to invest his work with that air of freshness and truth which is so essential to real Art. There are two ways of studying Nature, as of doing everything--a wrong way and a right. The advice to go to Nature for your decoration is so good that it is a pity it should ever be misunderstood; yet it is. It has too often been understood to mean the copying of natural forms and applying them at random, without any regard to fitness of purpose. Years ago, when Art had sunk low for want of direct reference to Nature, there sprang up a class of designers who founded what was called the "Naturalistic School." *They* went to Nature with a vengeance, torturing and twisting every natural form they came across, to serve every conceivable purpose.

Trees, made in metal, were made to support globes and bowls ; gas brackets were formed of leaves and flowers, from the delicate petals of which issued the scorching flame. The general flatness of wall surfaces was disregarded, paper-hangings being printed in pictorial imitations of natural forms. In fact, there was scarcely any limit to their misuse of Nature. A little consideration will convince most people that this is the wrong way.

The right method of studying Nature does not consist in merely gathering her facts and applying them indiscriminately to any object as decoration, but in the endeavour to understand the principles upon which Nature works, so that we may use her endless treasures with artistic wisdom. Moreover, by adopting this mode of studying Nature we shall find that all the records of ancient Art will have a new meaning for us.

Ornament may, in general terms, be defined as that which is added to objects of utility for the purpose of rendering them agreeable to the eye. It is of no actual use from a utilitarian point of view, though essential as supplying a universal want. All

nations, however uncivilized their condition, have their ornamentations. The savage, after he has fashioned his weapons of the chase, notches them over with various figures, and so satisfies his uneducated eye and desire for order.

It does not necessarily follow from our general definition, that any additions are therefore ornament in the true sense. On the contrary, we may decorate any thing by sticking on a flower or other natural form without showing any knowledge of Decorative Art whatever; it is mere adornment without Art. We can only raise our decoration to the dignity of an art by recognising certain principles which appear to underlie all that is beautiful in Nature, and which seem to have been the guiding principles of all the great masters of Art in all ages. Ornamental or Decorative Art rests on adaptation, and there cannot be true ornament unless we employ art in adapting our details to the object to be decorated. This gives us the key to the right understanding of the difference between Decorative and Imitative Art. The former is subject to limitations from which the latter is free.

Both are dependent upon the study of Nature, but the methods pursued differ materially. For instance: take any plant you like, and of which you desire to give a pictorial representation; you place the selected subject before you and copy exactly what you see, including accidentals of position, light, shade, and colour; and in doing it the consideration of structure need not trouble you very much. But, on the other hand, if you require a decorative work, you must adopt a different course; making yourself acquainted with general structure, order of growth, and all the facts connected with the plant, apart from accidents. In fact, you must endeavour to obtain a knowledge of the plant in its most perfect condition, to realise a true ideal of the object of your study. The power to render natural forms pictorially should not be neglected, but, on the contrary, should be cultivated to the highest point. But while this is being done, all studies of a pictorial character should be supplemented by careful analytic drawings, showing the way in which leaves are attached, the direction of stems and their articulation with one another, the difference between upper and lower leaves, the order

of their veining, and other important facts. The annexed drawing of the sunflower will best illustrate what is required. Fig. 1 is a pictorial rendering of the general appearance and growth of the plant. Fig. 2 shows the details and facts not revealed in Fig. 1, but which it is necessary to know for the purposes of decorative design.


FIG 1


FIG 2

Hence it is seen that the imitative artist is mostly engaged with appearances, while the decorative artist deals principally with realities.

It has been said that Decorative Art is based upon adaptation, and that there are limitations imposed in

the one case which are altogether absent in the other. We will now inquire into these limitations and see to what they lead.

In painting a flower from Nature, there is practically no limit to hinder the carrying forward of imitation to its utmost; but when the same subject is used for the decoration of useful objects, there are conditions to contend with peculiar to the materials and processes employed. In the endeavour to reproduce the same flower in embroidery, enamel, or iron-work, we soon discover that our attempts are surrounded by limitations, and that it is hopeless to enter into rivalry with painting, in its power of imitating texture, light, shade, and the varied gradations of colour. And whether we will or no, we are obliged to bend to circumstances, and adopt what is called a "conventional" treatment. Conventionalism is a stumbling-block to most students, from the fact that they indulge in a notion that it means stiffness and rigid formality; but this idea, by far too common, is wrong. A conventional treatment may be easy and flowing as well as severe; both qualities being necessary and valuable in their proper

places, as will be seen when the proper distribution of ornament is treated of.

Some time ago a question was put to me by a friend (who was, by the way, engaged in china painting). He said that he had seen it stated in one of Ruskin's works that you could not put too much Nature in your decorations, while another authority stated that you were not to put an imitative painting on a china plate; now how was he to reconcile these two authorities, which seemed to contradict one another? The contradiction is an apparent one, not a real one. As a proper understanding or rendering of the statements will prove, the phrase, "put as much Nature as you can into your work," does not necessarily mean copy all the accidentals of light and shade and perspective, because a little reflection will soon make you aware how false such a work must be. It is possible to put on this "picture-ornament," and yet leave out much of Nature.

As an illustration, examine a piece of pottery decorated in this false manner, which is so prevalent just now, and compare it with a similar piece of ware of Japanese manufacture: in one instance, you have a

picture in the wrong place; in the other, a decoration adapted to its purpose. Suppose that, in each case, the work represents a flower spray. In the English specimen there is the attempt to imitate the shine of the leaves, besides other accidentals connected therewith. All of these become false, the plate being a movable object, and seldom seen in the same position or light in which it is painted. While, in the other, light and shade are wisely ignored, and in their place all the refinements of form are given, and all the delicate details of Nature emphasized. In the former case these are lost in the pursuit of an effect, which, for its purpose, is false and unnatural.

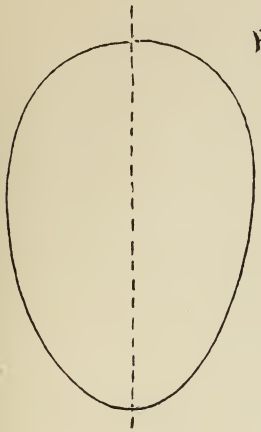
Decorative Art may be said to have had, as will be shown, a double origin—to be the offspring of two distinct faculties of the human mind: the *inventive* or *constructive*, and the *imitative*. Inventive ornament consists of abstract lines and forms arranged to produce a pleasing effect; this is the earliest kind of decoration. It is characteristic of the savage tribes, and traces of it are to be found in all the great styles, the frets and interlacings of the Classic and Mediæval styles

being of this character. Whilst the simple and rudimentary characters of this class of ornament afford the best elementary practice for all who undertake the study of decorative design, it also offers the best and simplest means of demonstrating some of the principles of ornament. There is an abstract form which seems to underlie, or enter into, the composition of many beautiful forms in Nature, which we call the oval or egg shape. (*See* Plate I.) It appears to be that upon which vegetable forms are principally based. It is the essential elementary form of leaves, simple and compound, and enters largely into the composition of the masterpiece of creation, the human form.

Let us examine the figure. On looking at it we note, firstly, that the two sides are alike, *i.e.*, they are repeated; also, that not only are they *repeated*, but are placed in *contrast* to one another; and, again, through the entire curve, unlike the curve of a circle, there is a constant change or *variety*. Hence we have three very important principles, viz., repetition, contrast, and variety. Observe, further, that the beauty of this oval form depends upon the pro-

portionate combination of principles; and this we shall ultimately see has much to do with all ornamental compositions, and will help to explain the different characteristics of historic styles of Art. Take an illustration or two of the application of these fundamental principles from a few elementary examples. The simplest arrangement of lines is perhaps given in Fig. A. As an effort in design, it is not satisfactory; there is only repetition, and, therefore, monotony in the extreme. But if we, in obedience to the law of variety, make the lines of various lengths (Fig. B), a more pleasing result will be obtained. Contrast the position of some of these lines, and we get a still better result (Figs. C, D).

See again the application of the principle to the arrangement of more interesting materials in Figs. 1, 2, 3, and 4. Fig. 1 is simple repetition; in Fig. 2 another leaf of similar form is introduced, thus adding variety to repetition; in Fig. 3 the leaves are contrasted; Fig. 4 illustrates the combined principles of repetition, contrast, and variety. Figs. 5 and 6 are other forms of repetition and variety. In these illustrations of the three elementary principles, it will be observed that



REPETITION
CONTRAST
VARIETY

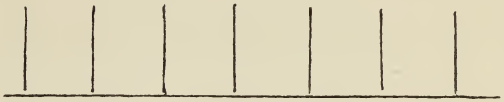
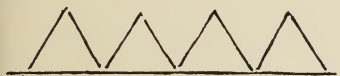


FIG A. REPETITION

FIG B REPETITION WITH VARIETY



CONTRAST WITH REPE^{N}
FIG C.

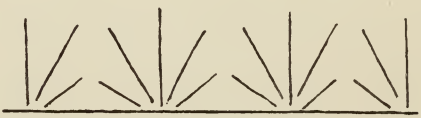


FIG D. REPETITION, VARIETY, CONTRAST

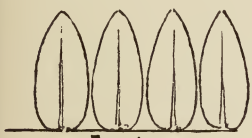


FIG 1.

FIG 2.

FIG 4.

FIG 3.

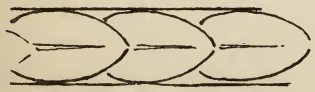


FIG 5.

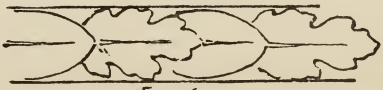


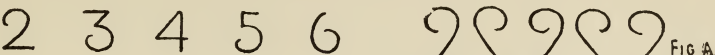
FIG 6.

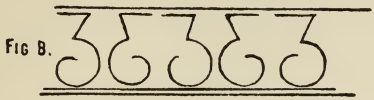
two other very important principles are evolved, viz., symmetry (see Figs. B and D) and radiation. Of these it will be well to speak in detail. Symmetry, or like-sidedness, has many forms of expression, resulting from the proportionate activity of these fundamental principles, or the entire repression of one of them; hence, we may have a form of symmetry involving repetition and variety only, as  , in which lines of various lengths are simply repeated on either side of a central one, or as in Fig. 1, Plate II., in which lines are varied in length and direction, and while they are repeated on either side of an axis, they are also, with regard to position, placed in contrast. These forms of symmetry are denominated bi-symmetrical; more complex arrangements are recognised, and are distinguished by other terms, as tri-symmetrical, when the doubling is repeated around a group of three central lines, as in Fig. 6, Plate II.; multi-symmetrical when grouped around more than three, as in Fig. 7. Symmetry as an Art principle is of immense value. It has the power of rendering details which in themselves are uninteresting, not to say ugly, into forms that are

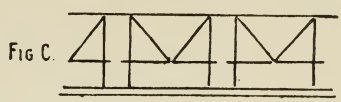
pleasing and ornamental. The well-known experiment of making a blot, or any irregular figure with ink upon paper, and folding it while wet, so as to repeat the exact form reversed or in contrast, is a good illustration of this principle (see Fig. 4, Plate II.). On the same plate are given examples of the effect of symmetry on the numerals, 2, 3, 4, 5, and 6. The principle of radiation, though often allied with the principle of symmetry, may yet exist without it (see Figs. 5 and 8, Plate II.), and is, as we have seen, the outcome of repetition, variety, and contrast. This principle, like that of symmetry, may have varied forms of expression, as shown on Plate II., Figs. 11 and 12, all of which are deducible from Nature, from the growth of plants, leaves, flowers, shells, the wings and feet of birds, and notably from the formation of the human hand (see Plate III.). So much for elementary principles.

Now a word as to their value in the practice of design. While they are of great importance, at the same time too much must not be expected of them. They do not supply rules the use of which must of necessity produce good ornament; but, on the other

2 3 4 5 6







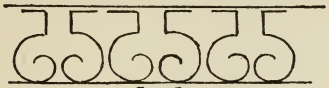


Fig D.

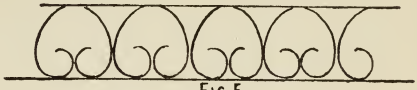
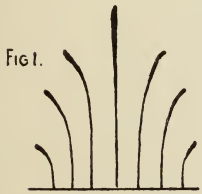
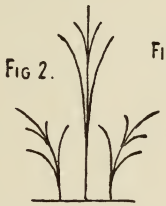


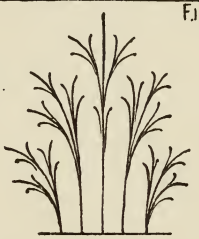
Fig E.



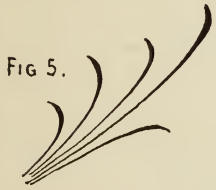
Bi-symmetry

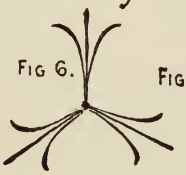


Tri-symmetry



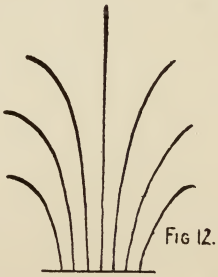
Multi-symmetry





RADIATION FROM A POINT.

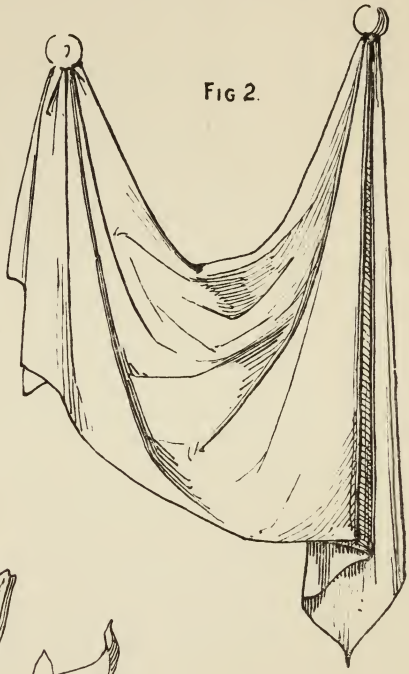
RADIATION FROM A VERTICAL LINE.



RADIATION FROM A HORIZONTAL LINE.

Fig 1.

Fig 2.



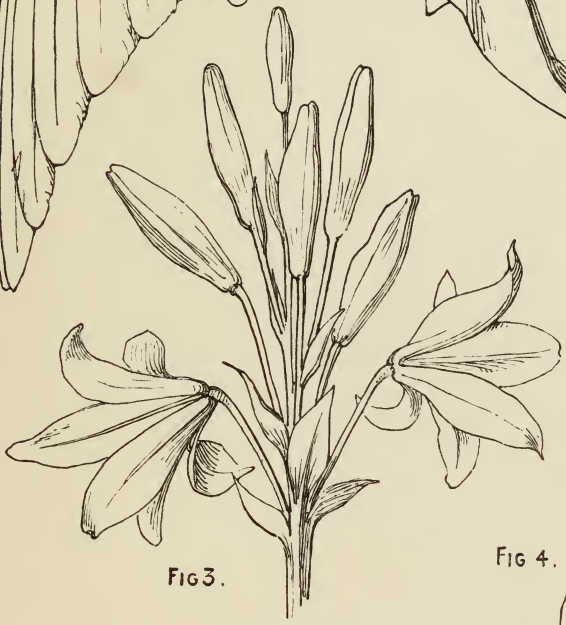
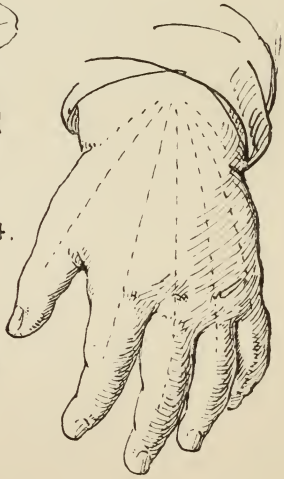


Fig 3.

Fig 4.



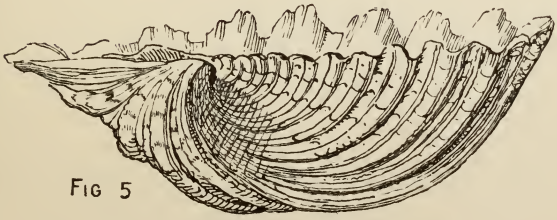


Fig 5

hand, their humble services should not be ignored. The over-estimation of these few principles leads many to doubt their value altogether. The unwisdom of adopting either extreme may be illustrated as follows:

Professor Ruskin, in his very admirable book of lectures, "The Two Paths," says in speaking on the matter: "My friend had been contending that the essence of ornament consisted in three things—contrast, series, and symmetry. I replied that none of them nor all of them together would produce ornament. Here, making a ragged blot with the back of my pen on the paper,  you have contrast, but it isn't ornament; here, writing the numerals 1, 2, 3, 4, 5, 6, you have series, but it isn't ornament; and here, sketching this figure,  you have symmetry, but it isn't ornament. My friend replied: 'Your materials were not ornament because you did not apply them; I send them to you back made into a choice sporting neckerchief.'" (See A, Plate IV.) Then the professor proceeds to reply by questions, thus; he asks: (1st) How did you determine the number of figures

you would put in the neckerchief? Had there been more it would have been mean and ineffective—a pepper-and-salt sprinkling of figures—had there been fewer it would have been monstrous. (2nd) How did you determine the breadth of the border, and relative size of the numerals? (3rd) Why are there no more lines? Why not three and two, or three and five? Why lines at all to separate the barbarous figures; and why, if lines at all, not double or treble, instead of single? Why did you put the double blots at the corners—why not at the angles of the chequers or in the middle of the borders?"

The replies to all these questions, by Mr. Ruskin's friend, are not given, wanting which, we will examine one or two matters connected with, or involved in, the argument before us. (1st) It will be seen that the friend claims too much for a few principles by saying that the essence of ornament consists in three things—contrast, series, and symmetry. He claims for rules ability to produce that which they can only aid in developing; while the professor denies too much by saying none of them nor all of them together will produce orna-

FIG A.

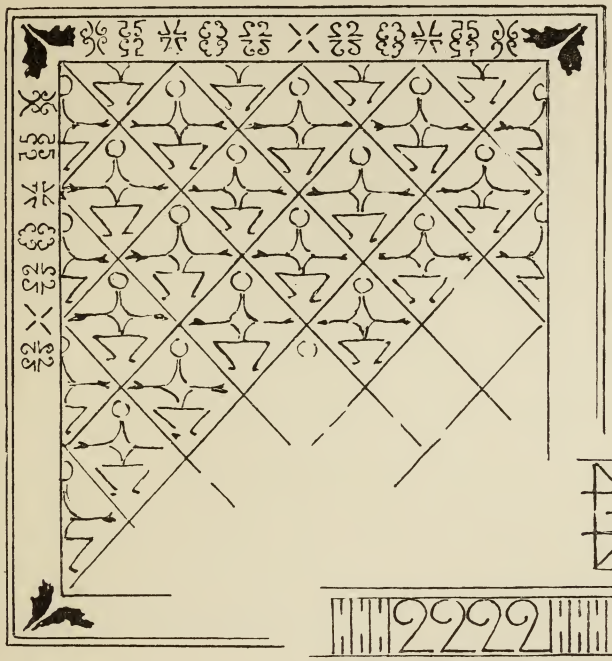


FIG 1.

FIG 2.

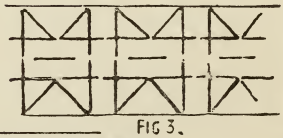


FIG 3.

FIG 4.

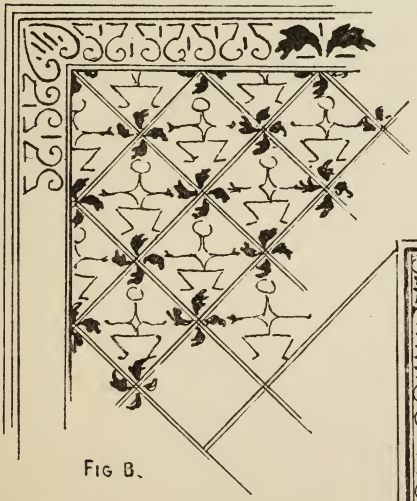


FIG B.

FIG 5.

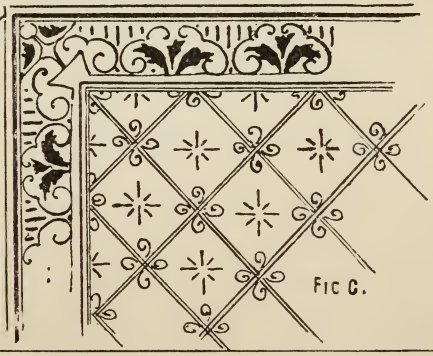


FIG C.

ment. Observe, first, that the friend says "your materials were not ornament because you did not apply them"; the reply should have been that the symbols of principles did not produce ornament because they were not combined. It will be seen that the friend did not contend that contrast by itself was ornament. Now take the symbol of contrast, the blot, and combine it with other principles. Arrange the contrasts in a simple series as in Fig. 2, Plate IV., or symmetrically as in Fig. 1, and the result, although not high-class ornament, is yet ornamental to a certain degree. Arrangements of some of the other elements are given in Figs. 3, 4, and 5. It will thus be apparent that the professor is wrong in his statement regarding the principles mentioned by his friend: "none of them nor all of them together would produce ornament."

Note, again, in the course of the argument a confusion of ideas regarding principles and materials, or elements, of ornament. Both the professor and his friend confound the two things which should have been kept distinct. Principles give methods of arrangement; materials are subjects chosen for arrangement;

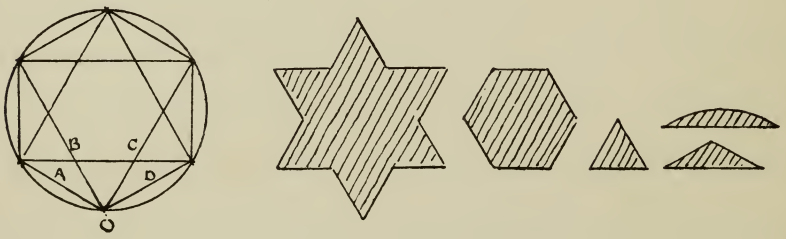
and the latter are generally chosen for their beauty. Positively ugly forms are never taken except for purposes of caricature. Whether we regard these figures by Mr. Ruskin as symbols of principles or as materials, they are not quite to the point. For instance, the numerals do not represent the principle of series at all. They are merely a smart play upon the term, and at best are only a succession of different forms—in fact, they are a better illustration of contrast than of series; while the grotesque figure is anything but good material for ornament.

Now as to one or two questions asked by Mr. Ruskin: "How did you determine the number of figures you would put in the neckerchief? And also the size of the border?" The principles laid down by the friend will certainly not explain this, showing that there are other principles to be taken into account, besides the three laid down, when applying ornament to any specific purpose. Again, it is asked: "Why are there two lines outside the border, and only one inside? Why not three and two, or three and five?" Here his friend might have replied: "Why not? It

certainly would be the richer for it." "Why were not the double blots put in the angles of the chequers, or in the middle of the border?" The same answer, "Why not?" will serve, because these questions only indicate how the pattern might be varied, giving results quite as satisfactory, considering the materials employed. (See Figs. B and C, Plate IV.) For we are not to assume that the friend's adaptation of the materials supplied to him was perfect, admitting of neither change nor variation, as Mr. Ruskin's questions would appear to suggest. On the contrary, it will be seen that it was one only of the many ways in which they might have been put together; and while the design certainly did not prove that the three principles constituted the essence of ornament, yet it demonstrated the error contained in the sweeping statement that "none of the principles nor all of them combined would produce ornament," by the practical transformation of indifferent material into a fair ornamental composition. And surely, if certain principles have power to transform into passable ornament such materials as Mr. Ruskin supplied, they may be expected

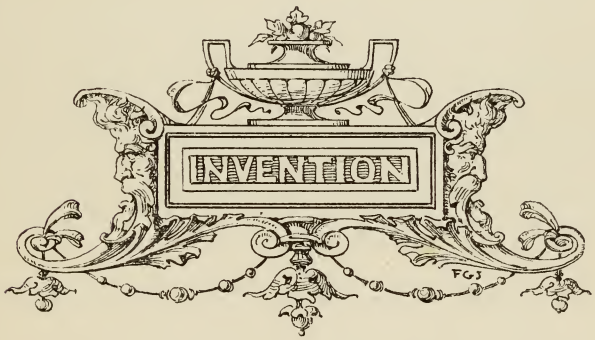
to command respect, and be accepted as useful help and guides in the practice of Decorative Art.

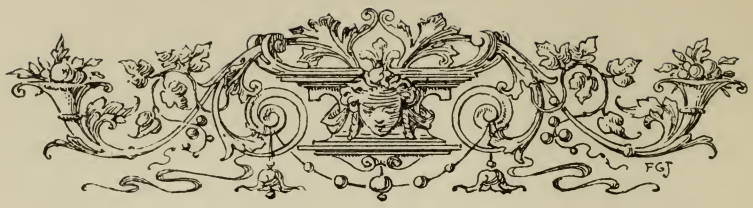
A further illustration of these fundamental principles is furnished by a question occurring in a Government examination paper in design: "If the circumference of a circle be divided into six equal parts, the points so determined may be joined by straight lines to form a hexagon and two equilateral triangles. Enumerate the elements and principles of ornament which the construction of the figure would or might be made to illustrate."



Looking at the figure carefully, it will be found that it yields five different ornamental elements. The principles illustrated are: repetition, by the series of triangles arranged round the figure; variety, by the different shapes of triangles; contrast, by the positions

of the two large equilateral triangles, and the chord in its relation to the arc of the surrounding circle; the lines A, B, C, D, starting from O, illustrate the principle of radiation; while the entire figure is perfectly symmetrical.





CHAPTER II.

LINEAR ORNAMENT.

It has been said, in the previous chapter, that the two books to be studied by the student of Decorative Art are History and Nature, *i.e.* the records of the Art of past ages, and the objects of the natural world; but, as already intimated, the study of History should occupy the attention first.

Turning, then, to a consideration of the earliest forms of Art which modern research has brought to light, the aim will be, while tracing successive developments, to point out the lessons they teach. In the examination of prehistoric pottery, for instance, it will be found that after the most suitable forms for the purpose required had been obtained, the easiest and readiest

means were employed of executing the decoration on their surfaces. The elements composing the patterns were of the simplest character, straight lines constituting the elements; a pointed stick, for incising or puncturing the soft clay, was the usual implement of production. Referring to Plate V., the student will see that the patterns, consisting of right lines variously arranged, are of the inventive kind, and are generally disposed in bands; he will further see that the patterns are the result of the arrangement of simple lines, in accordance with the fundamental principles already laid down. Pottery is selected for reference instead of woven fabrics because, on account of its material being more durable, a greater number of examples exist, and therefore it furnishes a reliable series of Art developments. But let it be noted, that the patterns evolved by weaving and plaiting suggested the patterns found on the pottery. The ornamental band on Fig. 1 is made up of right lines, contrasted and repeated. Fig. 2 shows another form of contrast and repetition, horizontal and oblique lines being used.

As regards the disposition of these bands of decoration, it will be found that there is an unconscious obedience to the law of fitness: they are not placed in a haphazard way, but in harmony with the structure they adorn. In the first place, the rim appears to be generally selected for decoration, in order to give the part most liable to fracture an appearance of strength, while any change in the contour of the form of the vessel is a favourite place for additional ornamentation. If it was thought desirable really to strengthen the vase or pot, naturally that which appears to be the weakest, the rim, would demand first attention, and this could be done by adding a band of some tougher material; but as no actual necessity exists for strengthening the object, ornament supplies the place of the supporting material. Its æsthetic value is this: that while it does not weaken the part to which it is applied, it satisfies the eye in the sense of security which it conveys. In the second case, the change of curvature being marked by decoration results from an appreciation of structural necessities. For instance, if it were found that there was some difficulty in making

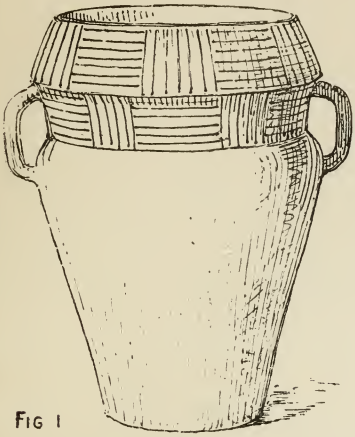


Fig 1

Fig 2.

ANCIENT BRITISH POTTERY

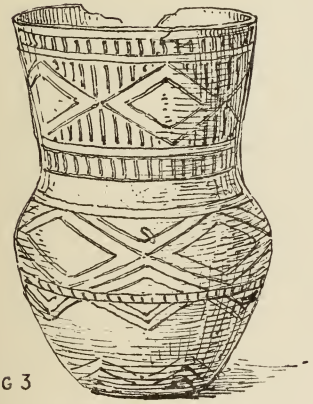


Fig 3

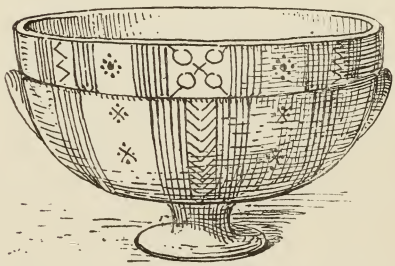


Fig 4 ANCIENT CYPRIAN

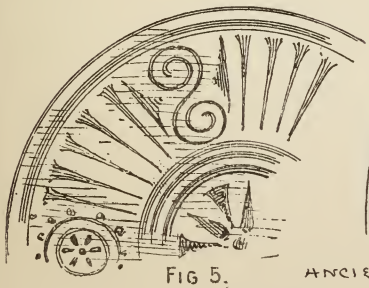


Fig 5.

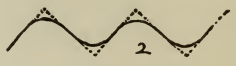
Fig 6.

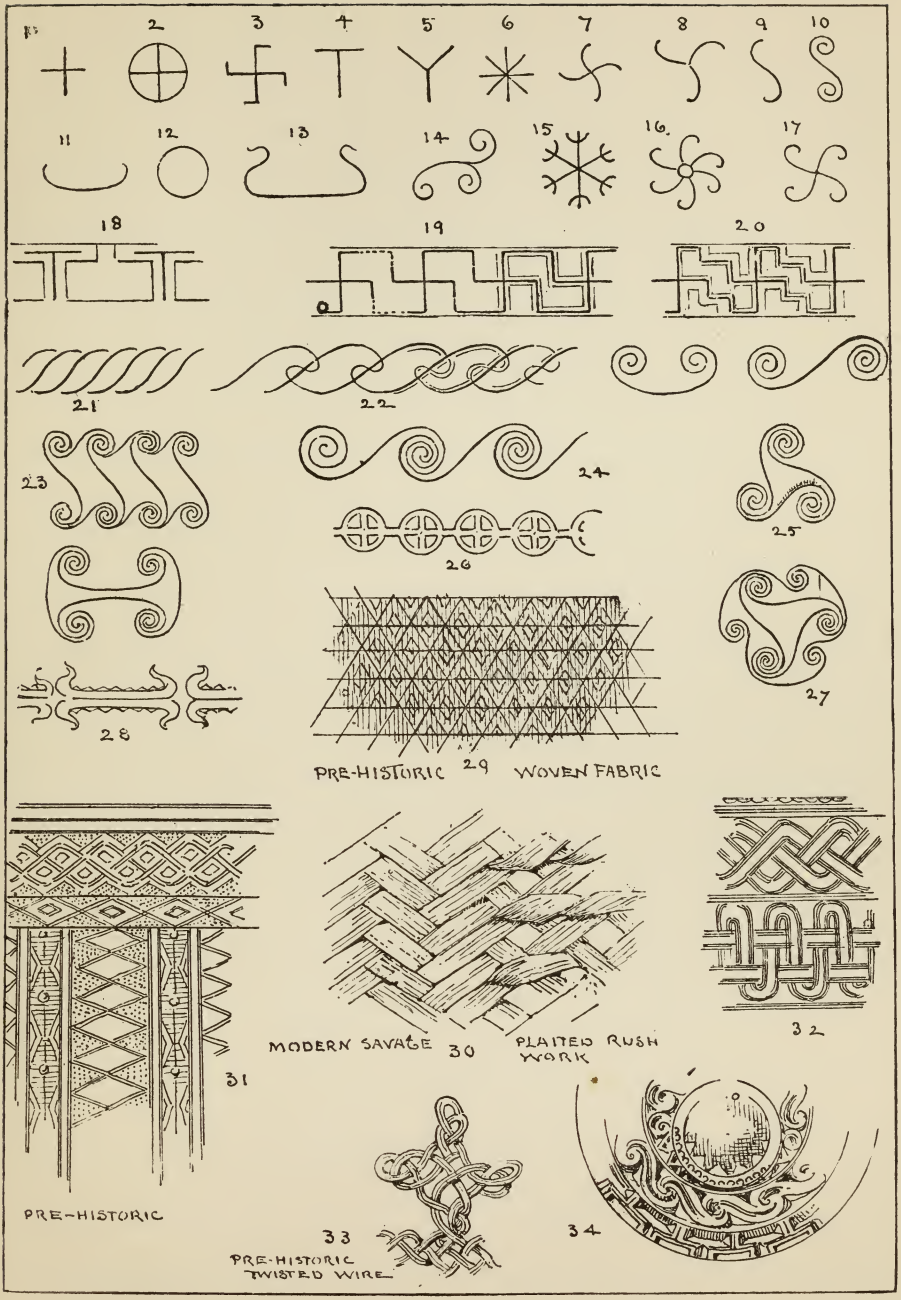
ANCIENT GREEK

a form like this  to retain its shape when in a plastic condition, we should undoubtedly apply some supports, internally or externally, as a remedy, and the points we should select for the purpose would be where the changes of outline occur, thus:  For a similar reason, bands in a vertical direction are adopted, as in Fig. 4; and again, although the object to be decorated may not require any such extraneous aids for the maintenance of its form, the placing of ornamental bands in this manner, and at these parts, satisfies the eye and gives a quality of firmness and compactness to the vessel.

This structural reason for the placing of the ornamental bands may be supplemented by reference to a principle observed in Nature. We see in the vegetable world the changes in the directions of stems are generally accented in some way or other, more or less distinct; for instances, see Plate XIX.

In the later examples of prehistoric decoration, the severer patterns formed of straight lines give place to others formed of curves. The zigzag, so common to

early Art, subsequently becomes softened, developing into wave, scroll, and spiral lines. The changes arise in this manner:    first, the angles are rounded off; afterwards, the other portions of the line between the curved angles are softened and graduated. On many objects belonging to prehistoric Art are lines and figures selected and used as certain sacred signs, emblems of primitive religions. These signs were impressed, first singly, afterwards in combination; and so were produced ornaments in which the original emblems were almost, if not entirely, lost. This is the origin of many elaborate ornamental details found in later historic Art. On Plate VI. are given some of these sacred signs, taken from the "Industrial Arts of Denmark." For full information of the theories and particulars concerning them, the reader is recommended to consult that very interesting work, because in these pages it is only possible to consider them as factors in the development of ornamental Art, apart from their symbolic meaning. Figs. 1, 3 to 6 are sun signs, composed of straight lines; Figs. 7, 8, 15, 16 and 17 are curved varieties of similar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PRE-HISTORIC
29
WOVEN FABRIC
31
MODERN SAVAGE
30
PLAITED RUSH WORK
32
PRE-HISTORIC
33
PRE-HISTORIC TWISTED WIRE
34

signs. The different forms, assumed both in the straight and curved lined series, represent the various gods supposed to exist in the sun. The forms shown in Figs. 9 and 10 are called sun snakes. They were used to symbolize the sun's path through the heavens, and also lightning or heavenly fire. They resulted from a softened form of the zigzag, before alluded to. At first the form given in Fig. 9 was used singly; afterwards, a spiral at each end was added, as in Fig. 10. Figs. 11 and 12 are emblems of the moon in two phases. Fig. 13 is a sign called the sun ship, used to typify the sailing of the luminary through the sky. In Fig. 14 we have a combination of the moon sign and sun snake. Now all these signs, used first singly, were afterwards repeated in series, and lastly joined together with additional parts—forming patterns more or less complete, which may be recognised in many historic styles. For instance, the sun symbols (Fig. 4), sometimes called the Hammer of Thor, placed side by side, and a line traced round the intervening space, as in Fig. 18, gives a familiar form of fret ornament, and the Swastika (Fig. 3), arranged in series

and connected as in Figs. 19 and 20, give other and richer forms of the fret. Figs. 21 and 28 are examples of ornaments which originated in a similar way. Figs. 29 and 30 are given to show the constructive origin of some straight-lined ornaments, upon which the curved forms were based. Fig. 33 is a piece of twisted wire-work which also shows the constructive origin of interlaced patterns, which mark the later periods of prehistoric Art. In Figs. 31, 32, and 34, we have examples of the application of some of the above evolved ornaments to industrial objects, taken from the before-mentioned work.

From these illustrations, together with the foregoing remarks, it will be seen that Decorative Art has had a constructive origin. The primitive man must needs construct coverings for his body, and in doing so he found that the different orders in which he placed the strands of his woven or plaited fabrics produced certain patterns —such as the zigzag, lozenge, etc. In later periods, when he had learned the use of metals, he saw that in the twisting of wires for various decorative purposes, the lines naturally took a curved direction, yielding curvi-

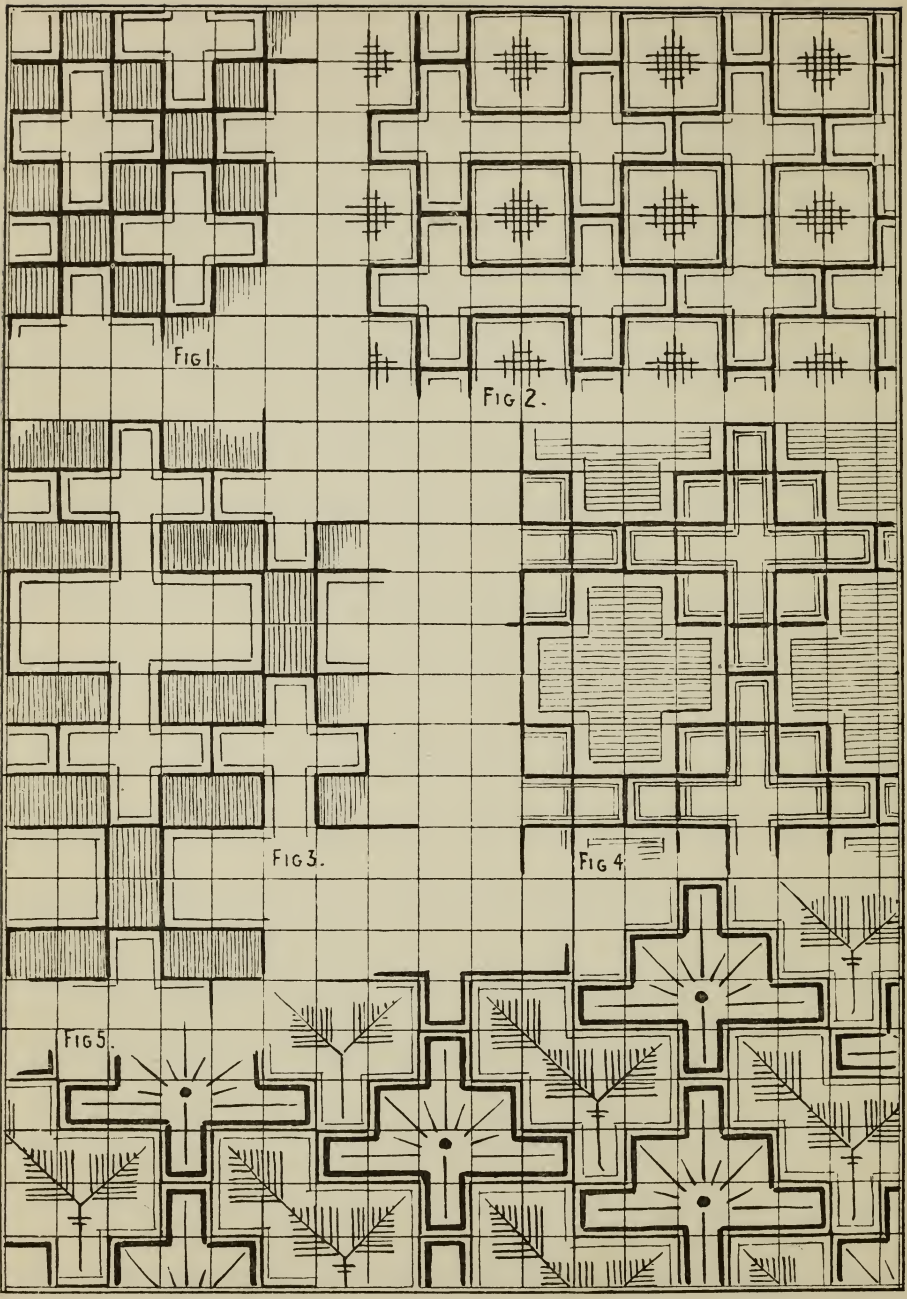
FIG 1.
FIG 2.
FIG 3.
FIG 4.
FIG 5.

linear forms and patterns. All of these evolved figures afforded him so many suggestions for the decoration of objects in other materials, and they were adapted, in a more or less modified form, according to the conditions necessarily attached to the particular material to be dealt with. This being so, we have clearly indicated a definite starting-point for the practical study of Decorative Art.

Hence, let the student begin his practice by drawing a few lines, at equal distances apart, and others crossing them at right angles, producing square meshes; then emphasize certain portions, after the manner of the examples shown on Plate VII.; and he will, by exercising a little ingenuity, having regard to contrast of line and varying quantity, be able to evolve various patterns, more or less pleasing. Fig. 1 is perhaps the simplest form of pattern upon such a basis, and consists of repeated crosses alternated with squares. Fig. 2 shows a pattern evolved from the crossed lines, composed of double crosses and squares; in the middle of the latter are added cross lines of various lengths, but parallel to the sides of the squares. Fig. 3 gives

another pattern, resulting from the inclusion of a greater number of the foundation squares. Fig. 4 shows how an interlaced design may be produced; while in Fig. 5 we have a more elaborate design. The way in which the two main figures are generated can be easily traced. The filling in is by vertical, horizontal, and oblique lines; the first two being parallel to the sides of the squares, the oblique ones being coincident with the diagonals of the squares. The whole exhibits, in an elementary form, the principles of contrast, variety, repetition, symmetry, and radiation.

Plate VIII. shows a different series of patterns, evolved, first, by tracing along the diagonals as well as the sides of the squares, as in Figs. 1, 2, 3; secondly, by the use of semicircles, struck from the angles of the squares, in combination with right lines (see Figs. 4 and 5). The details filled in follow the original lines of the pattern. The production of patterns upon a simple basis of squares is almost unlimited, and the principles applied to other arrangements of lines will give further results. A few examples of this are given on Plate IX. In Fig. 1 we have lines crossing at right

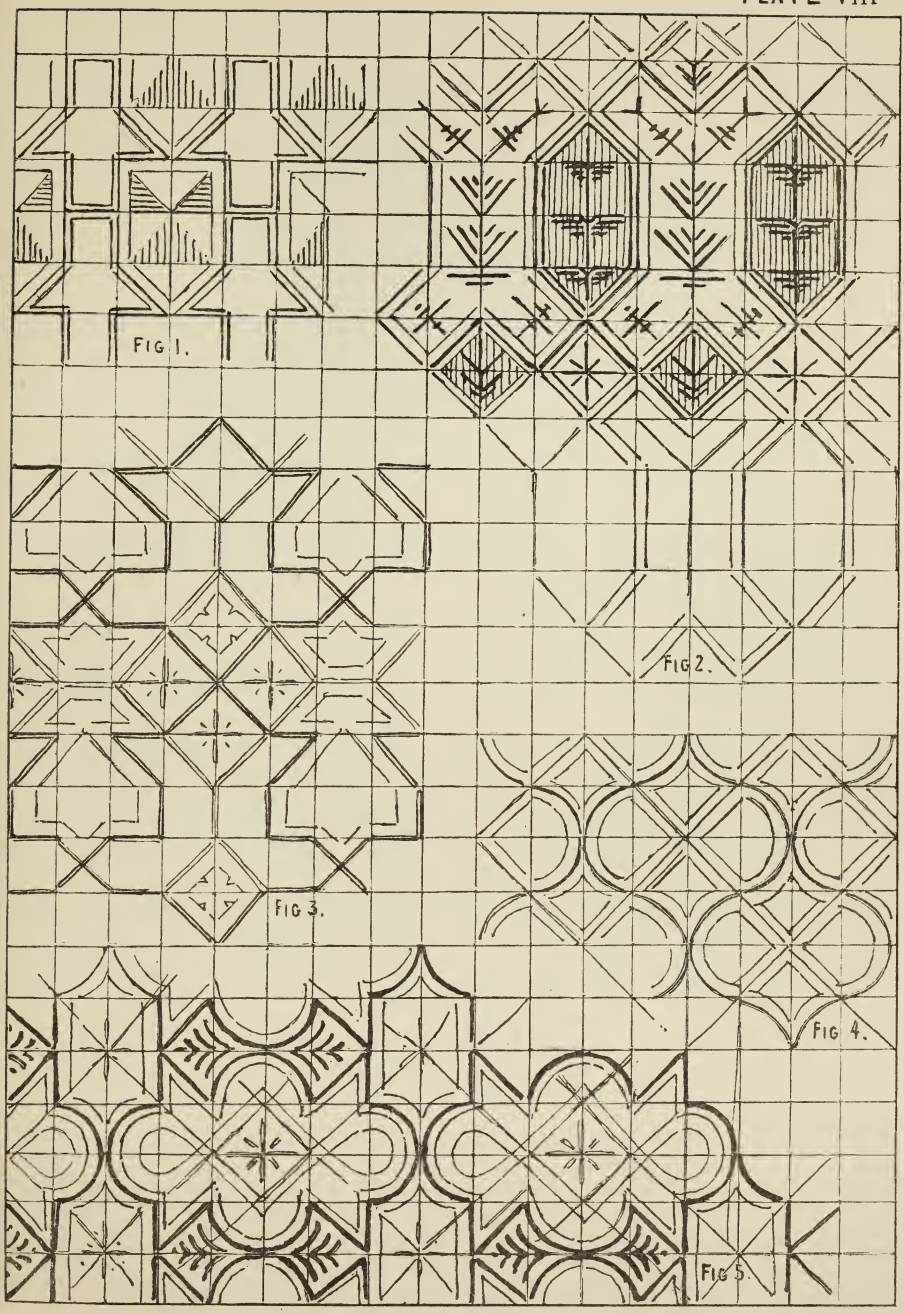
FIG 1.
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Fig 1.

Fig 2.

Fig 3.

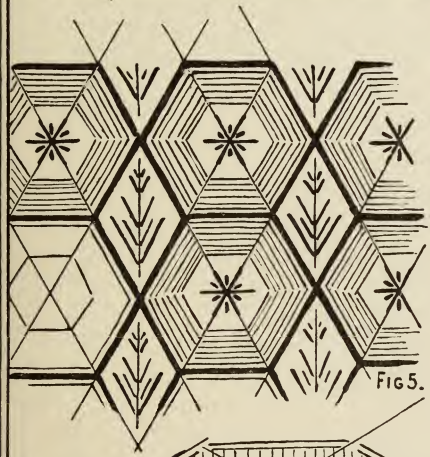

Fig 5.

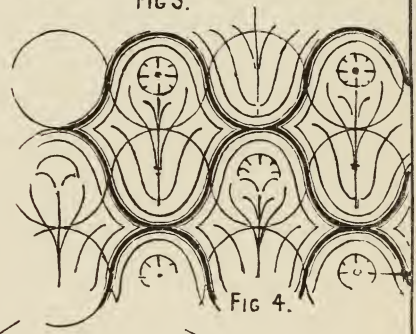

Fig 4.

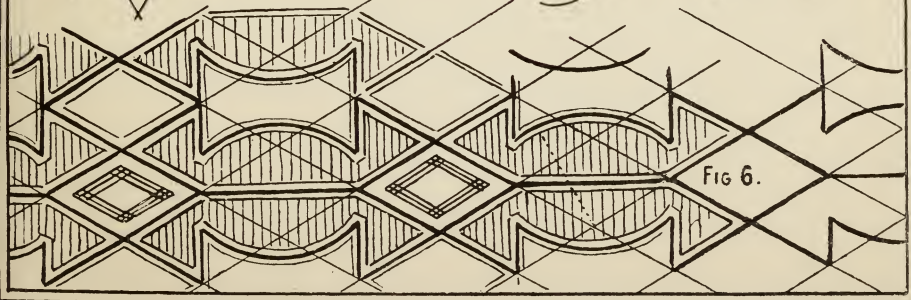

Fig 6.

angles of different distances, leaving spaces of an oblong form. Curves are struck within them, the centres of which are marked. Fig. 2 shows a series of semicircles, emphasized so as to generate a trefoil pattern. Figs. 3 and 4 are patterns resulting from a basis of circles. Figs. 5 and 6 are developed upon oblique lines crossing each other, leaving lozenge-shaped spaces. And so, by an analytical examination of the foregoing illustrations, it will be seen that a variety of figures has been produced, such as

Figs. 1 2 3 4 5 6

These, if abstracted, can be used as elements for the construction of new patterns.

The above forms have been taken from Plate VIII., and on Plate X. are shown some examples of the use made of them in the formation of different patterns. By further analysis we can reduce these figures to simple elementary lines, thus:

And, by using them in a similar manner, we can obtain other and better results. Plate XI. exhibits a few results of a recombination of these lines: Fig. 1 is an orderly arrangement of right and oblique lines of various lengths; Fig. 2 is composed of right angles; Fig. 3 of obtuse angles. The other examples will be explained by reference to the initial forms given above.

These simple linear materials, of which the examples just given are composed, may be considerably added to if we consult the higher class of geometrical forms, such as the ellipse, parabola, and spiral, all of which yield curves of great decorative value. Artistically speaking, the curve of the circle is less satisfactory than those derived from any of these figures, because it lacks variety. The curve of the ellipse is of better quality, from the presence of what is altogether absent in the circle; while the curves derived from the oval and the parabola are superior to either, having the necessary qualities of beauty and grace. Curves of the circle can only vary in size, not in their bend, their flexure always remaining the

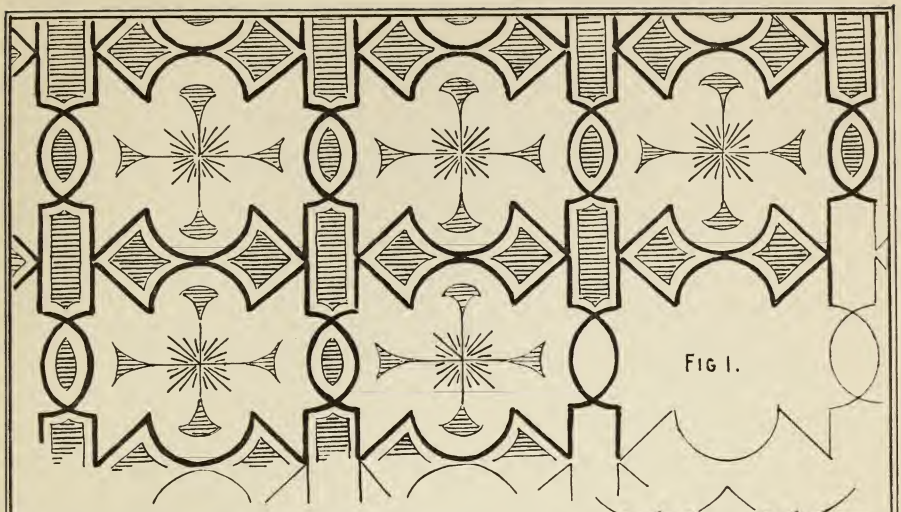

FIG 1.

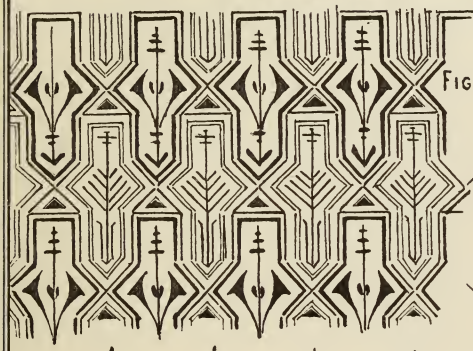

FIG 2

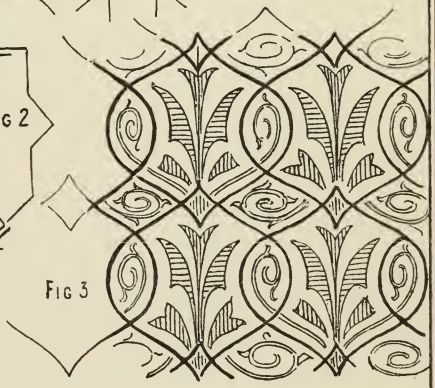

FIG 3

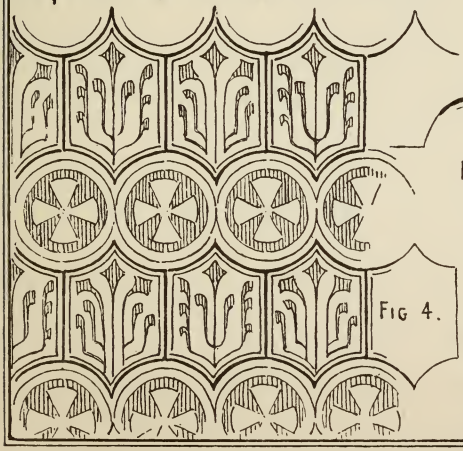

FIG 4.

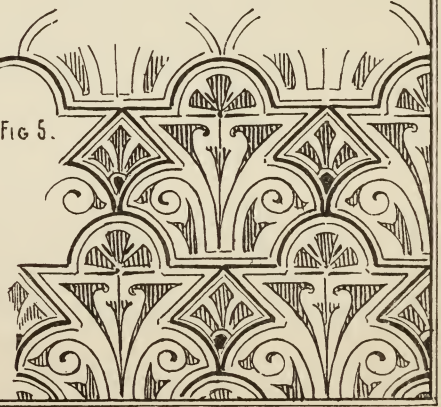

FIG 5.

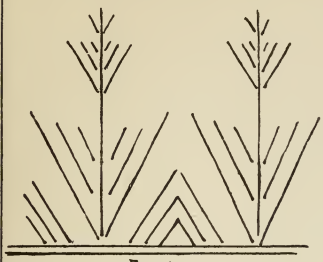

FIG 1.

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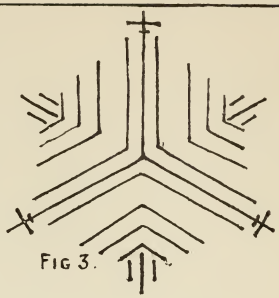

FIG 3.

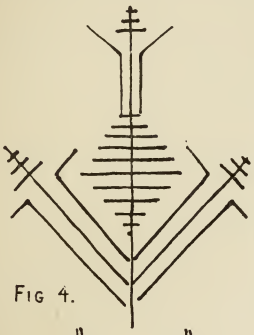

FIG 4.

FIG 5.

FIG 6.

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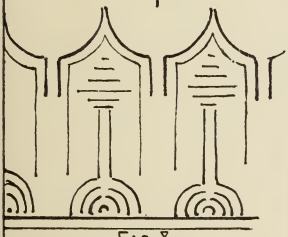


FIG 8.

FIG 9.

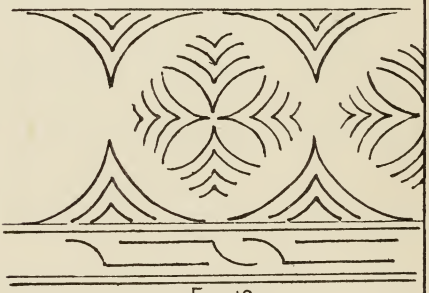


FIG 10.

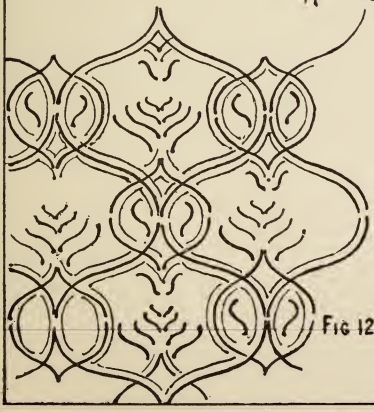


FIG 12.

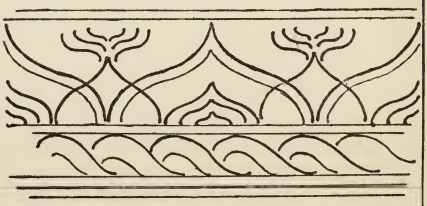
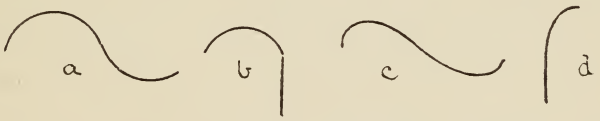


FIG 11.

same, whether large or small; while, on the other hand, the parabolic or elliptical curves vary in their degrees of flexure. Their variety is almost unlimited; they range from delicate curves, but slightly removed from the straight line, to nearly the full swell of the robust curve of a circle. Not only are these parabolic and elliptical curves beautiful in themselves, but they combine harmoniously with one another. Note with what abruptness two curves of a circle meet when placed to form a compound curve of double flexure (*a*), or when joined with a straight line (*b*). And note, also, the gradations which are shown in the like combinations of parabolic curves (*c* and *d*). The superiority of the latter will be obvious.



In the first cases the joining is palpable, while in the others the fusion of the two lines is so complete that it is difficult to determine the points of juncture, and consequently there is a more perfect unity of line.

Now take these curves and combine them with one another and with right lines, as under.

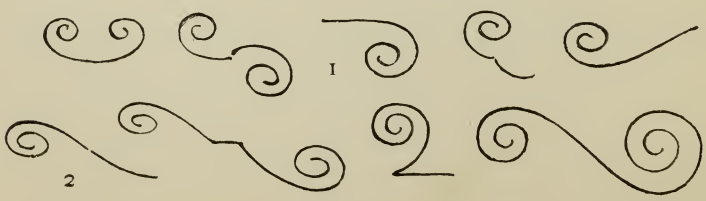
(1st.)—Curves of the circle, with straight lines :

(2nd.)—Curves of the circle of different radii :

(3rd.)—Curves of the oval, with right lines :

(4th.)—Curves of the oval, with one another :

(5th.)—Spirals with the above :



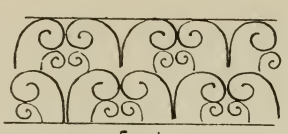


FIG 1

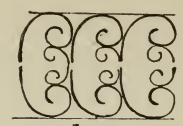


FIG 2.

FIG 3.

FIG 4

FIG 5.

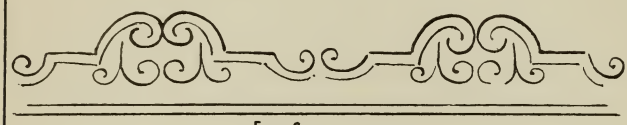


FIG 6

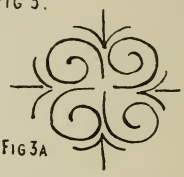


FIG 3A

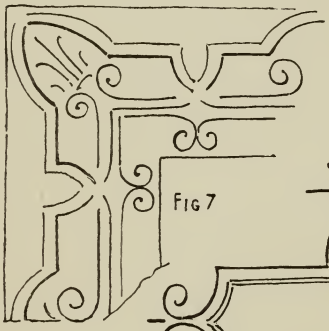


FIG 7

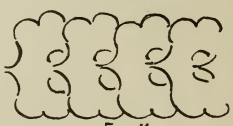


FIG 11.

FIG 8.

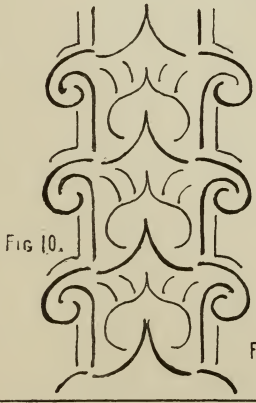
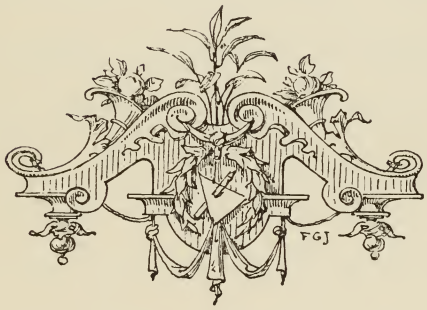


FIG 10.

FIG 9.

The result is a number of compound lines, which can be employed in the formation of other and richer patterns, examples being given on Plate XII. Figs. 1, 2, 3, 3A, are composed of lines similar to 1, page 58; Figs. 4 and 5 of lines marked 2; and so on.



CHAPTER III.

BRUSH-WORK.

So far we have been dealing with linear patterns similar to those found on prehistoric pottery and fabrics. The ornamentation on the pottery was chiefly expressed by incising, or puncturing, the soft clay with a hard point, as previously stated.

It is now necessary to consider another method of expression employed in subsequent periods, viz., by the use of the brush. The use of this implement, we shall find, led to much that is excellent in ornamental Art. Many of the beautiful Greek forms which are so familiar, are the outcome of the easy play of the brush. The so-called honeysuckle ornament and many of the borders which appear on Greek vases, often referred to natural types, are purely and simply ingenious

arrangements of brush forms. At first, lines similar to those expressed by the use of the style, or hard point, were reproduced, as was natural; but as the capabilities of the brush came to be understood, a new order of decorative forms was evolved. The flexibility of the instrument answering so readily to the varying pressure brought to bear upon it during the course of the stroke, led to forms such as  *

These present a striking contrast to those decorative details which were evidently copied from such as had been produced by the stiff and non-pliable instrument, the stylus. Now let the student see for himself what the brush is capable of. Let him take a moderate-sized round sable brush, and, charging it with water-colour, make various strokes upon the paper, varying the pressure as he proceeds. For instance, bring the brush fully down

* This kind of decoration is best studied in the actual works preserved in our museums; the lithographic representations of it are too often misleading, for the artistic quality of hand-work is lost in the precise and machine-like reproductions.

upon the paper, then draw the brush downwards, gradually lifting it as it approaches the end of the stroke, thus :  Then, repeating this process in a curved direction, a form like this  will be obtained; and so, by fixing upon different points for the greatest amount of pressure, the result will be an immense variety of forms—forms that are peculiar to the instrument, and as characteristic of it as are the linear forms produced by the pointed style, as in the earliest stages of Art.

If the student will turn to Plate XIII., he will there see some examples of these brush forms, grouped together so as to form patterns. Fig. 1 is an arrangement of the simplest of the brush forms, on the principle of radiation. Figs. 2, 3, 4, and 5 are symmetrical compositions of various brush forms placed in series as borders. Fig. 6 shows a multi-symmetrical grouping of similar forms. The remaining figures, as will be seen, are but variations of the foregoing, suitable for centre ornaments and borders.

Thus it appears that the brush may be employed

FIG 1

FIG 2

FIG 3

FIG 4

FIG 5

FIG 6

FIG 7

FIG 8

FIG 9

FIG 10

FIG 12

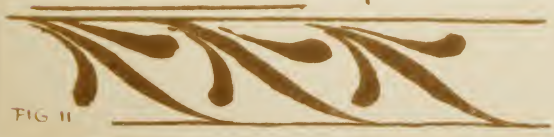


FIG 11

TO FACE PAGE 90

so as to generate forms available for the production of patterns distinct from those obtained by the use of the point. Let it be observed here that the use of the brush marks a very important stage in the development of Decorative Art, and carries it forward beyond the unsatisfactory limits of geometric design. The more facile execution which the brush affords, enables the artist workman to express his ideas with greater freedom, besides increasing his store of elements for future compositions.

The student will no doubt have observed that these brush forms are very suggestive of natural leaves and flowers, for, although they are purely inventive shapes peculiar to the implement employed, yet in general form they closely resemble many objects present in Nature. This likeness must also have struck the mind of the primitive artist, and so he naturally turned to Nature for suggestions for further enrichment of these inventive decorative details. Thus we get the combination of the inventive and the imitative principles; and in the process of time this results in the creation of certain Art forms, which have decided natural

characteristics without at all being mere copies of Nature. For instance, in Plate XIV., Fig. 1, the two brush forms placed together resemble a simple ovate leaf; by adding smaller forms, after the manner of serrated leaves, an enriched ornamental type is produced, the basis being inventive and the idea of enrichment suggested by reference to Nature. Still following the examples of Nature wherein she repeats the minor forms, we have even richer figures more nearly approaching Nature (Fig. 2). The development of the so-called acanthus foliage is a good example of the process of enriching pre-existing decorative forms. In Fig. 3 there is the palmate arrangement of brush forms (*a*), then a repetition of smaller ones grouped (*b*), giving the edge of each lobe the appearance of a serrated leaf; the whole result being the creation of an ornamental leaf, which, while it has no exact prototype in Nature, yet possesses natural qualities and is more truly decorative than a natural leaf can be, because it has been developed out of certain constructive necessities and in perfect harmony with natural laws.

I was once pointing out to some students in a

FIG 1

FIG 3

b

a

FIG 2

FIG 4

FIG 5

FIG 6

FIG 7

TO FACE PAGE 42

class the difference between a natural leaf and an ornamental one of the kind just spoken of, and calling attention to the features that had been influenced by a reference to Nature, when I was met with the question: "Why not make it at once a direct copy of a natural leaf?" The question appeared a pertinent one, but it betrayed the ignorance of the questioner. He evidently had neither known nor appreciated the natural development of this historical decorative detail, for if he had studied its artistic growth such a question would never have suggested itself to his mind. This student had, without doubt, adopted the too common notion that ornamental forms are mere degradations of natural ones, instead of being, as they should be, inventive forms enriched by the study of Nature. There are certain advantages to be derived from this brush-work which it will be well to point out: (1st), by drawing in mass instead of line, as must necessarily be done in using the brush; for where a design depends upon the distribution of masses, the composition is more quickly realized in the earlier stage, and with more certainty than would be done if first outlined and then filled in; (2nd), a

greater and readier power of drawing will be acquired, which is an important matter, for all decorative work should be easily expressed. A little practice will enable the student to render or interpret natural forms by simple brush-play, and he will find it easy to adapt certain forms, resulting from particular movements of the brush, to the expression of his model; and in so doing he will gradually gain an insight into what puzzles so many young beginners in design, viz., "Conventionalism of natural forms," because he will have to consider the capabilities of his implement for producing those forms which come nearest to the realization of his idea, and, as a consequence, his work will exhibit due regard for the method of expression and the thing to be expressed. An intelligent use of means, a right appreciation of natural objects—these two things combined lie at the bottom of all true conventionalism, and will produce results superior to those obtained by a process of laborious and servile copying. The importance of conventionalism as an Art principle will increase in value when the student enters on the study of applied

FIG 1

FIG 2

FIG 3

FIG 4

FIG 7

FIG 5

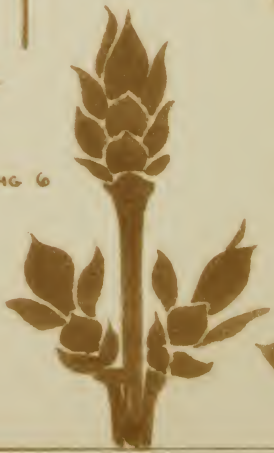


FIG 6

FIG 8

TO FACE PAGE 95

FIG 1

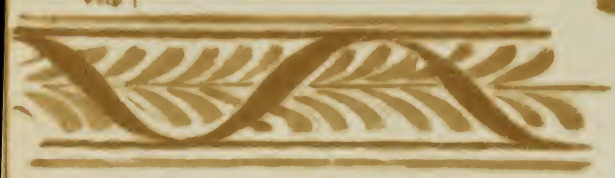


FIG 2

FIG 3

FIG 4

FIG 5

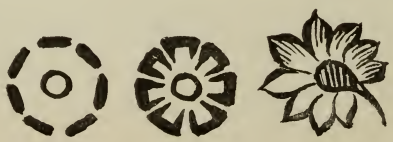
FIG 6

FIG 7

design, because of the varied conditions incidental to particular processes of manufacture. On Plate XV. are some examples of plant forms, expressed by simple brush strokes: Figs. 1 and 2, buds of the horse-chestnut; Fig. 3, from a later development of the same, in which the wrinkled character of the folded leaves is represented by a series of strokes brought up to the midrib; Fig. 4 is a representation of the common yellow broom; Fig. 5, buds of the white lily; Fig. 6, leaf-buds of the lilac; Fig. 7, a flower-spike of common grass. In these examples it will be seen that much detail has been omitted, while the characteristic general forms have been emphasized. The student will have noticed, that during his practice with the brush he had some little difficulty in maintaining an equality in the strength of his colour; this will doubtless suggest to him an additional means of expression, viz., the use of tones or shades, which are analogous to the emphasizing lines in linear compositions. The value of tone in surface designs will be understood on reference to Figs. 3 and 4, Plate XVI., both of which consist of the same group of forms, but with the tones

reversed. The other examples are given to indicate the kind of study that should be pursued in this direction. On Plate XVII. are given some examples of Eastern pottery decorations. The patterns, though they have a naturalistic look, are yet the product of brush-play rather than the result of copying Nature. They are inventive brush forms arranged according to general ideas of Nature. The ornaments on Fig. 1 consist of simple strokes; the details of those given in Figs. 2 and 3 are composed of several strokes, and, in some cases, of strokes of different tones. For instance, some of the leaves are thusconstructed: first, a form like this,

made in a light tone of colour, others of a darker tone being subsequently added, thus: The flowers or rosettes occurring in both examples are formed thus:



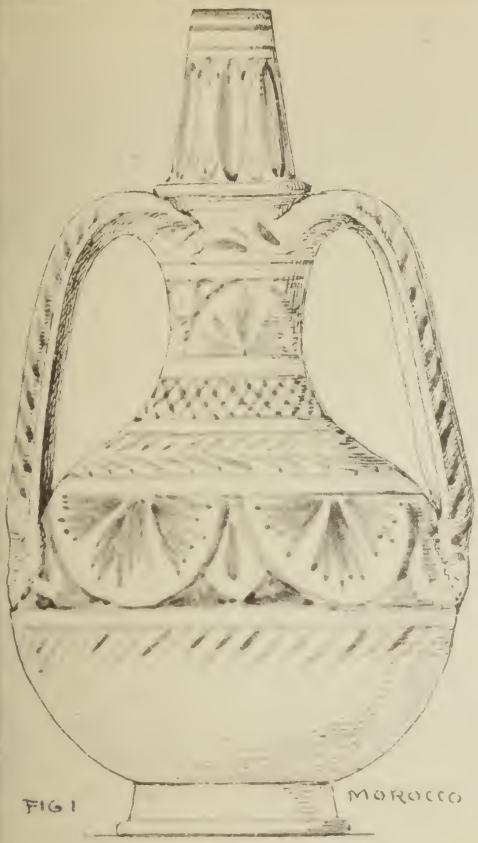


FIG 1 MOROCCO

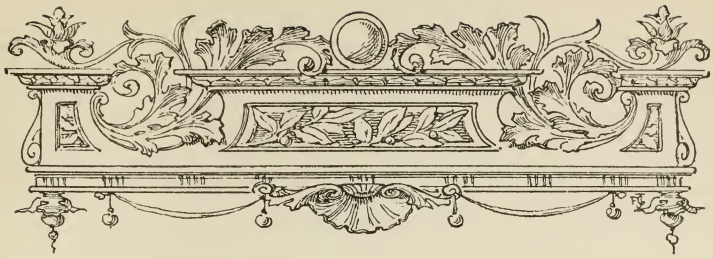
FIG 2 PERSIAN

FIG 4

FIG 3

INDIAN

'SCINDE'



CHAPTER IV.

THE STUDY OF NATURE.

The history of Art clearly shows that, as civilization advanced, more ability to use the means of ornamental expression was developed, and that, as mere inventive or geometric design was found to be insufficient, Nature was more generally resorted to for suggestions and ideas, in order to add to pre-existing forms new features, which would lend to them new interest. This we find was done in such a way that the new elements harmonized with the old. The natural representations, though based upon the imitative principle, were not merely pictorial copies, but modifications, or, as we say, conventional renderings. Now it is the union of these two principles, the inventive and the imitative, that has developed all the great styles of ornamental Art;

and this greatness is due to the nice balance of these principles. When, in the history of Art, the balance is disturbed—that is to say, when either principle predominates—then we get decay. When the constructive or imitative principle is too pronounced, the style becomes unsatisfying, cold, and primitive; while, if the imitative and realistic principles become paramount, the style suffers, ending in certain decadence. Therefore, in using natural forms in Decorative Art the student must be on his guard against running into mere pictorial representation, because forms so rendered will not harmonize with the older decorative lines and figures he may be called upon to use in conjunction with them.* He must be careful to adapt them by a judicious conventionalism. There are two

* This caution is the more necessary, as some people, in their one-sided admiration of Nature, imagine that natural forms, being beautiful if copied, must necessarily be beautiful, however applied. They regard Nature as a storehouse of "ready-made ornament," instead of a book of reference for ideas and principles to be thought out with diligence, and applied with care. "Ready-made ornaments" are too often like "ready-made clothes": badly fitting, and ill suited to the subject.

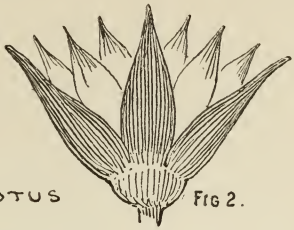
kinds of conventionalism found in historic examples: first, the conventionalism of principles or ideas; and, second, the conventionalism of facts. The first has to do with the principles and general ideas of growth common to classes of objects and not to specific forms; the second, with individualizing particular plants and objects.

An example or two from Egyptian and Greek Art will best explain the matter. The Art of the Egyptians, being purely symbolic, bound them to the conventionalism of facts, and while they had to represent their favourite plants, the lotus and papyrus, they did not copy pictorially, but gave "conventional representations of them sufficiently suggestive to convey the intended image." On Plate XVIII., which is devoted to examples of the two kinds of conventionalism, are given two drawings (taken from Owen Jones' "Grammar of Ornament") of the papyrus and the lotus (Figs. 1 and 2). Although the two plants are dissimilar in shape, yet we often see them given within a similar outline; notwithstanding this, the Egyptian artist contrived to preserve the individuality of both plants. In each

example the plant is adapted to the old form of zigzag, and in later ones each plant assumed a curved form (see Plate XVIII.). In both cases, however, the characters of the plants are kept distinct. Compare Figs. 1 and 4, and 2 and 3, and the identity of the plants with their ornamental renderings will be at once apparent. The Art system of the Greeks, on the other hand, was founded on æstheticism, and therefore, unlike the Egyptians, they felt no absolute necessity, in their use of Nature, for representing particular plants (though at times they did not fail to do so); and hence we find that they usually adopted natural principles or generalized forms without indicating any individual natural type. For instance, in Fig. 6 will be seen the embodiment of the principle of the growth of trailing plants—a serpentine line giving off on either side leaf-like forms, resulting from brush-play, in non-imitative leaves. Here there is no attempt to represent any particular plant: the only aim is to represent general ideas belonging to a class. The way in which the junctions of scrolls are decorated, as seen in Greek Art, is not the result of imitating any particular natural

PAPYRUS

FIG 1.



LOTUS

FIG 2.

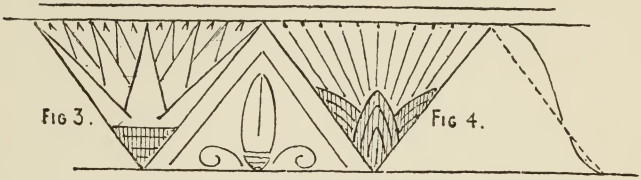


FIG 3.

FIG 4.

EGYPTIAN.

FIG 5.

CONVENTIONALISM OF FACTS

PERSIAN

FIG 6.

GREEK

FIG 10.

GRECO-ROMAN

FIG 7.

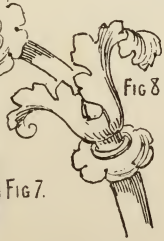


FIG 8.

EARLY ENGLISH

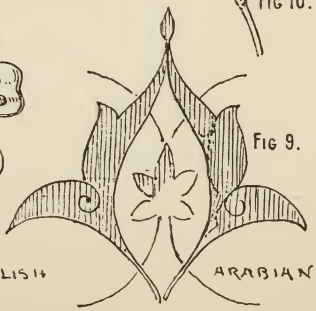


FIG 9.

ARABIAN

CONVENTIONALISM OF IDEAS

type, but the generalization of a principle of stem clothing observable in Nature (Fig. 7). The same may be said of various kinds of ornamental foliage,—such as the Classic acanthus, Early English and Arabian foliage, none of which are direct copies of Nature, but conventionalisms of ideas of growth, grouping, and leaf serration (see Figs. 8, 9, and 10).

As regards the "acanthus" foliage, we may be reminded that there are two kinds, named after natural types, viz., the *Acanthus spinosus* and the *Acanthus mollis*. This is true, but, though so named, there is no proof that they are copied from those plants; on the contrary, the evidence is all in favour of their being simple embodiments of principles observed in those two natural types, which are held in common with many others. Now, both these modes of conventionalism point to an endeavour to create Art forms based upon suggestions from Nature. Which method is the better of the two it will be difficult for some to decide, seeing that opinion is divided thereon. But the fact that the great styles of the Classic, the Romanesque and the Early Gothic of the Middle Ages, and the

Renaissance of later times, have been largely shaped by the conventionalism of ideas, should have some weight with those who are desirous of coming to a decision on this matter. But whichever principle is adopted, the study of Nature will be all-important; the only difference will be in the method of study, and the mode in which the knowledge obtained is applied. To this study we will now turn our attention. Plants, as we know, ordinarily spring from seeds, and develop in two directions, upwards and downwards; the part that descends is called the root, the ascending or upper portion the stem. The latter throws off branches and bears leaves, buds, flowers, and fruit. The former takes various shapes, many of which are worth the attention of the ornamentist, and should receive more attention than they usually do. The ascending stems also take various forms: some are erect without joints, as rushes or sedges; others again, like wheat or barley, have straight stems with joints and sheath-like appendages; and lastly we have the stem, which throws off branches bearing leaves, flowers, and fruits; forming a large class, and including not only small plants, but also our forest

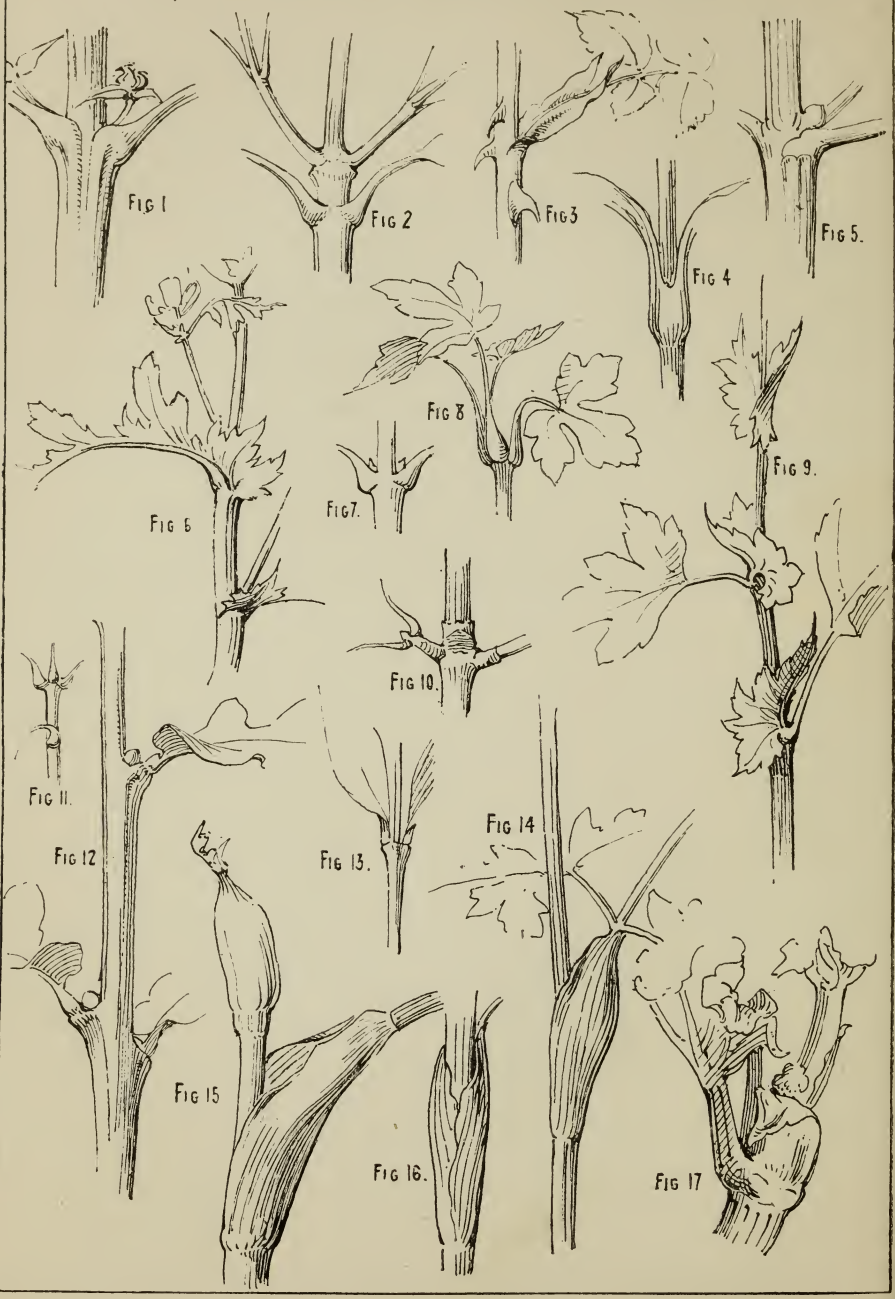


Fig 1
Fig 2
Fig 3
Fig 4
Fig 5.
Fig 6
Fig 7.
Fig 8
Fig 9.
Fig 10.
Fig 11.
Fig 12
Fig 13.
Fig 14
Fig 15
Fig 16.
Fig 17

trees. With regard to stems and branches, the first thing that demands notice is the order of growth. When a branch is developed, that part of the stem below the point of departure is thicker than the portion immediately above (*see* examples on Plate XIX.). This fact is too often missed by students when drawing from plants, and their non-appreciation of it in Nature causes them to omit in their decorative work that essential quality of good ornamental drawing—gradation. The next matter to be observed is the variety of forms assumed by branches at the point of departure from the parent stem, because they offer many useful suggestions. On Plate XIX. are given a few examples. Along with these forms should be studied the various appendages which are attached to the base of leaf-stalks, many of them being very beautiful and of great decorative value (*see* Figs. 3, 9, 15, 17, on the same Plate).

Next to the general growth and arrangement of plants comes the consideration of the leaves, and these should be studied as systematically as possible, according to their development. The leaves of plants are almost bewildering in their variety of form; and so

erratic do the various shapes appear, that the casual observer is led to think that there is an entire absence of any ruling principle in their evolution. Attentive study, however, will show that the apparent vagaries are the result of order and method in development; and it is precisely this ruling principle that the student of design should endeavour to grasp, for it will not only enable him to see the intentions of Nature, but help him to render the various forms more truly. Let us consider for a moment the development of simple leaves, taking our start from a leaf like the laurel. This leaf, it will be seen, is ovoid in shape, the elemental or controlling form of all leaves. If we develop or expand this form in a vertical or lateral direction, so: we get the general form of many well-known leaves. If we take the reverse form of leaf, and develop it in the same manner, there will be like results. Again, on the basis of either of these

Fig 1.

Fig 2.

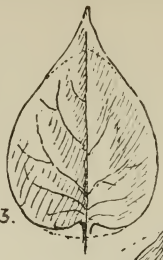


Fig 3.

Fig 4.

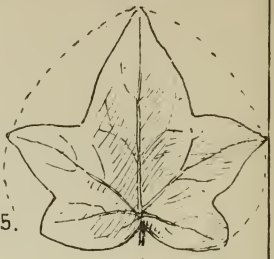


Fig 5.

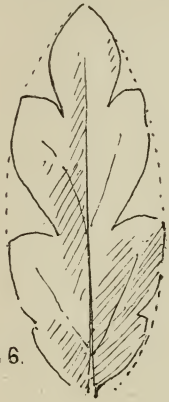


Fig 6.

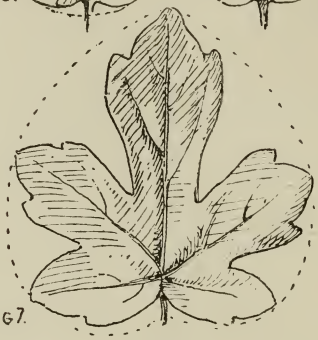


Fig 7.

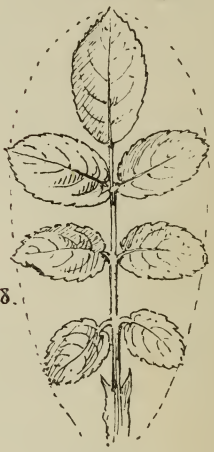


Fig 8.

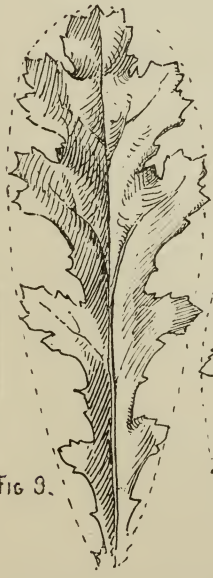


Fig 9.

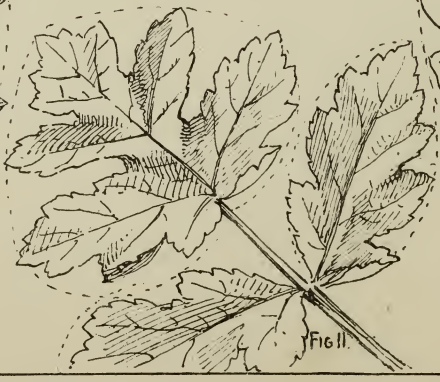


Fig 11.

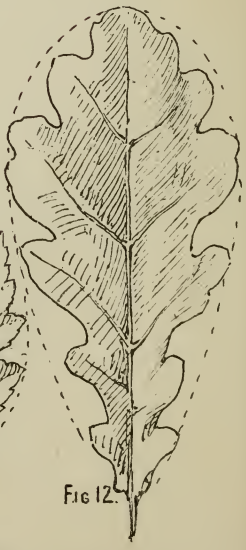


Fig 12.

forms can be developed other shapes by the repression or development of parts: thus the point of the leaf is extended and the base repressed, and a form produced like the leaf of the bind-weed. 
The repression of portions of the leaf-surface within their elemental forms produces varieties more or less compound in character, as for instance in Fig. 5, Plate XX. Further, this process, if repeated upon the various forms of leaves thus obtained, gives us the different classes of leaf-edges, which are added to give richness to forms both simple and compound (*see* examples given on Plate XX.).

Next taking flowers, we shall find that the same general law, as regards the development of leaves, holds good in the case of flowers, *i.e.*, the varieties are developed within certain simple forms of limit; but while the principle is the same, we shall find that the number of the regulating forms is much greater for flowers than for leaves. A very large class have the circle for their basis; the parts being arranged in a star-like manner, and the points of division suggesting the

square, triangle, pentagon, and hexagon. On the upper portion of Plate XXI. is shown the development of floral forms. Fig. 1 is a monopetalous flower, the convolvulus, which shows but a slight departure from the circle, in the shaping of the edge; it is divided into five portions. In Fig. 2, the buttercup, the slight indentations are carried down to the centre, forming distinct petals. In Fig. 3, the cinquefoil, we have the subdivisions of the petals; while in Fig. 4, the campion, these subdivisions are increased. Again in Figs. 5 and 6, these divisions of the petal's edge are carried down to the base, which gives a flower of a compound character, as the ragged robin and daisy. In some cases the petals, instead of being merely cleft, as in Figs. 3 and 4, are indented along the edge, as in sweet william (Fig. 7). Now consider for a while the side views or elevations of these stellate flowers, that we may see the order of development in other directions. Taking the form  as our normal shape, which, it will be seen, lies within a triangle, we shall find,

FIG 1

FIG 2

FIG 3

FIG 4

FIG 5

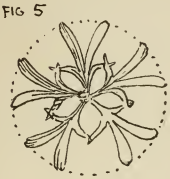


FIG 6

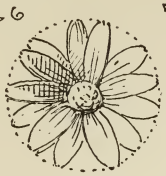


FIG 7

FIG 8

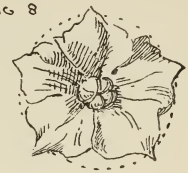


FIG 9

FIG 10

FIG 11

FIG 12

FIG 13

FIG 14

FIG 15

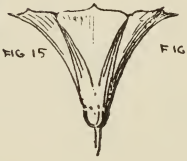


FIG 16

FIG 17

FIG 18

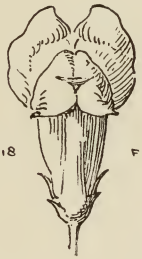


FIG 19

FIG 20

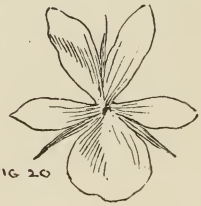


FIG 21

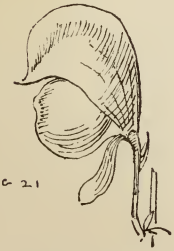


FIG 22

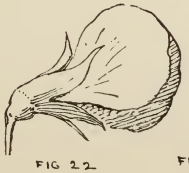
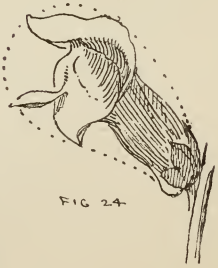
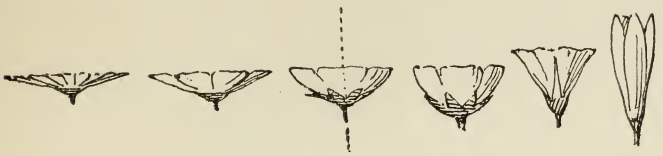


Fig 23

FIG 24



as in the case of leaves, that lateral and vertical expansion, with the development of parts, will include



many varieties. On the middle of Plate XXI. are given some examples. Fig. 10, the cinquefoil, shows a slight deepening of the corolla; Fig. 13, the herb robert, is an example of the vertical expansion of the corolla and calyx. In Fig. 11, the crocus, a more pronounced vertical development of the whole flower, the sepals of the calyx are absorbed, as it were, into the corolla. Fig. 16, the campion, shows in a very marked way the development of one part over another by the vertical expansion of the calyx.

There is another large class of flowers, which for the most part have a vertical growth, and are bi-symmetrical when seen in front, but of somewhat irregular form when viewed from the side. These, again, seem to be developed within some general

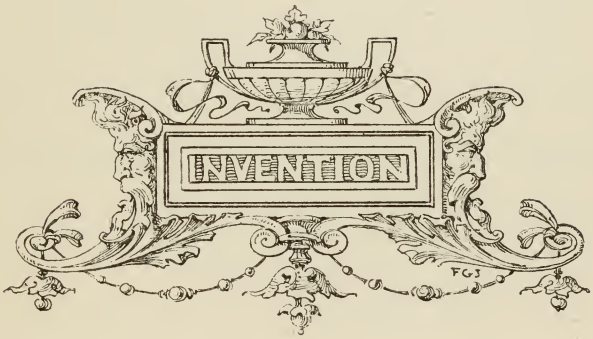
shapes. The front views appear to be developed within ovals generated by lateral and vertical expansion, as

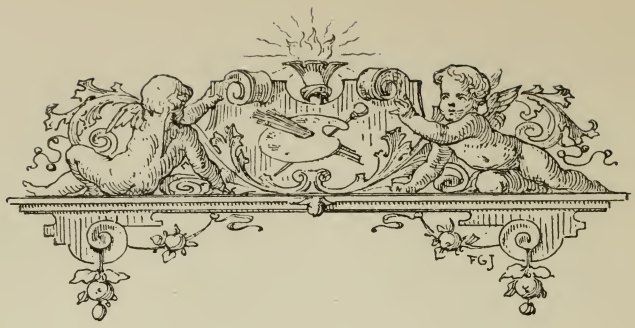
The side aspect, within a form of this character,  is varied by the same process. On the lower part of the same plate are given a few examples drawn from Nature: Figs. 17 and 22, the edible pea; 18 and 24, the snapdragon; 19 and 21, monk's-hood; 23, common nettle. Fruit forms should be studied in a similar way; but, as their ruling forms agree with those that regulate the varieties of leaves and flowers, it will not be necessary for me to do more than refer the student to Plate XXII. for examples.

In the study of vegetable forms it may not always be easy to detect the controlling figure within which they are developed, because of defective growth, irregular development, and complexity of the particular specimens examined; but all the same the search should not be relinquished, for when the guiding form is obtained,


Fig 1.
Fig 2.
Fig 3.
Fig 4.
Fig 5.
Fig 6.
Fig 7.
Fig 8.
Fig 9.
Fig 10
PLAN

the student will be in possession of the means of correcting defects of growth and realizing higher ideals; besides which, he will have a better grip of his subjects and a fuller mastery of his materials.





CHAPTER V.

CONVENTIONAL ORNAMENT.

In the last chapter, we have endeavoured to indicate the method in which Nature should be studied by the student of design. In the present one, we propose to show how the results are to be applied to ornamental compositions. It has been already shown that historic Art furnishes examples of two distinct ways of using natural forms for ornamental purposes: the one taking general ideas and principles for the further development of current Art forms; the other reproducing the actual shapes of natural objects in a more or less modified form. These two methods, it will be remembered, were illustrated by references to Egyptian, Greek, Persian, and Gothic Art. We will proceed now to show, in a practical way, the extent to which

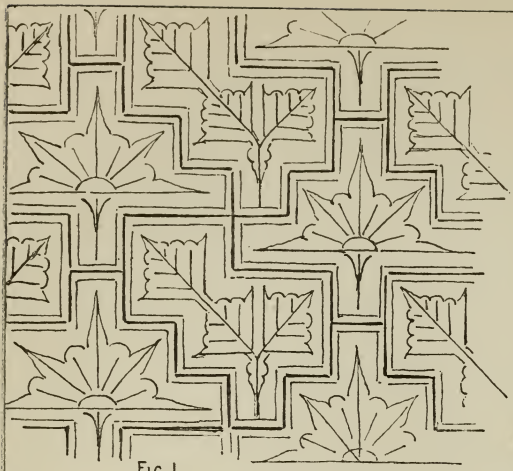


Fig 1.

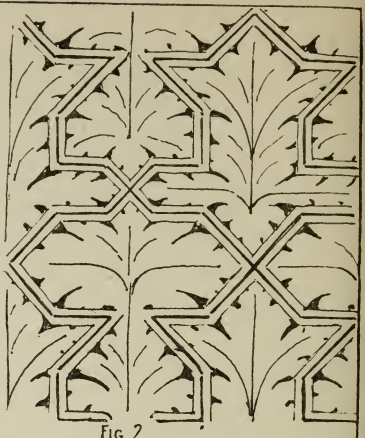


Fig 2.

Fig 3.

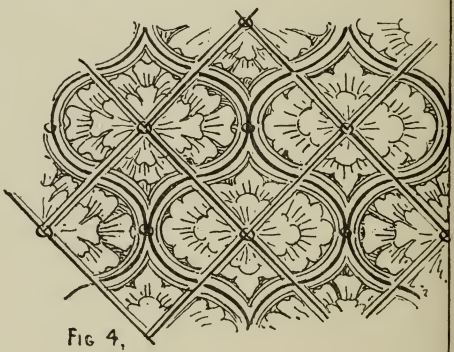


Fig 4.

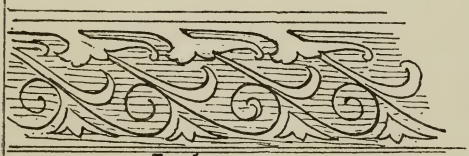


Fig 5

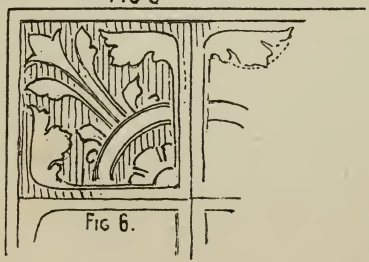


Fig 6.

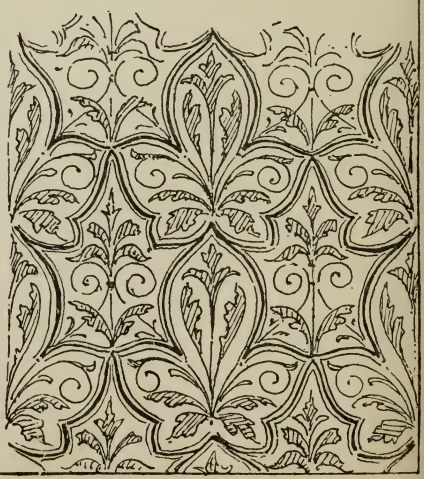


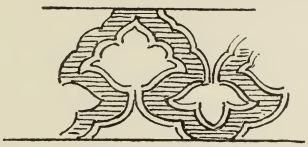
Fig 7.

both systems are available in the adaptation of Nature to ornamental Art. Let us take the first method, viz., the one which contents itself with ideas and principles. Turning to Plate VII. and referring to Fig. 5, we find an inventive design composed of horizontal, vertical, and oblique lines, described on page 46. Now, to develop it into a more interesting pattern, we have only to surround the extremities of the radiating lines with others, such as may be derived from the study of leaf and flower edges, as shown on Plate XXIII., Fig. 1, adding to a pattern a suggestion from Nature. Fig. 2 on the same plate is a development of Fig. 3, Plate VIII., obtained, in a similar way, by taking the general principle of rich serrated leaf edges, in which the indentations are of unequal sizes, as—

Fig. 3 is the amplification of Fig. 3, Plate IX. This has been effected by adapting the general ideas of lobed leaves for the filling in of the spaces formed by the geometric lines. Fig. 4 shows the addition of forms suggested by flower petals to the design on Plate VIII., Fig. 4. Fig. 6 is an

enriched version of Fig. 6, Plate XIII. Again, on Plate XII., Fig. 5, is an inventive combination of curved lines, starting from a horizontal right line; and in Fig. 5, Plate XXIII., we have the ornamental expression of a principle of Nature, whereby she generally marks or emphasizes a change in direction, seen in the divergence of stems; and so, regarding the curves as branching from the straight line, a general form of stipule has been added. Other illustrations of this mode of conventionalism will be found on Plate XXIV., Figs. 1, 3, and 6. In Fig. 7, Plate XXIII., we have an illustration of the use to which borrowed forms from plant life may be put, in laying out surface designs. The form of the repeat is suggested by a five-lobed leaf, minor details being omitted. The repetition of geometric forms over a surface yields very good patterns, but it will be found that for many purposes leaves and flowers offer more excellent suggestions, producing far better, more varied, and richer results. This method of using natural forms appears to have been practised by oriental artists, and although many of their figures have been considerably

modified, yet they retain distinct marks of their origin; for instance, the form so commonly met with in Arabian Art (see Plate XVIII., Figs. 9 and 10) is easily traceable to its source: a group of young leaves terminating a branch. Again, in Indian Art, a favourite way of spacing out is that of using a form like this, evidently suggested by a flower or bud of the lotus kind, while diapers are often to be met with, laid out with a leaf form, as,



or,

In all these examples the student will observe that there has been no attempt to represent particular plants: the aim has been to utilize suggestions from Nature, and to adapt principles and ideas for the further development of inventive designs. Now let us consider the second mode of adapting plants to decoration,—that is to say, the one in which, for symbolic or other reasons, the individuality of the plant is to be preserved. Having chosen the plant suitable for our

purpose, in adapting it we are not, as has already been stated, to minutely copy the plant as though making a picture of it, but so to study it as to realize its true characteristics, which distinguish it from other plants; in other words, to form an ideal of the model. To do this it will be necessary to carefully examine more than one specimen of the selected plant, because a peculiar or accidental mark in one individual of the class may not be found in another. What is required, then, is the knowledge of the features that are common to the family or kind to which the chosen plant belongs. This can only be acquired by an extended investigation. A limited examination will very likely result in an unnatural rendering of our subject. Any characteristic which only belongs to one individual is unnatural, and therefore to be discarded. To copy Nature as she is presented to us, with all the accidents and defects, would be to render her realistically. To correct her by our knowledge of her derived from a wide study of her works, would be to treat her naturally. What is common to the class is the nature of it; what is exceptional is actual and real, but is

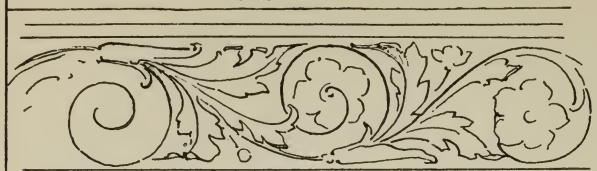
unnatural. Take an example. Here are three leaves copied from a spray of ivy:

Nos. 1 and 2 cannot be regarded as ideal or natural leaves, because the shapes are not like average ones, the majority of the leaves being like No. 3. Nos. 1 and 2 are certainly actual leaves, but they cannot be said to be in accordance with the intentions of Nature; they bear unmistakable signs of restricted development. No. 3 has had a freer growth, and for that reason may be taken to be more natural in form. Again, some four-petaled flowers will occasionally develop an extra petal; but examination will show that four, and not five, petals are the rule: therefore, the typical or ideal flower should only have the lesser number.

It has been said that the method of using plants which is now being considered, consists of a modification of their forms, more or less according to circumstances, agreeable to the preservation of the

plant's identity. Now the extent to which the modification of details is to be carried will be determined by their application, whether the formation of a free or severe design. If used in conjunction with the severe forms of a geometrical arrangement, they necessarily will undergo considerable modifications; but if with free lines, then there will be less departure from original forms. The freer the lines of arrangement, the more naturalistic the treatment of the parts, the more rigid the lines of composition, the more severe the rendering of the details. Thus we find in Egyptian Art that the severe scheme of the decoration influenced the rendering of natural forms, while in the freer character of Persian Art we have a more naturalistic rendering of details (see Plate XVIII.). To practically apply the principle here advanced, let us take some natural plant, such as the marsh-mallow, and adapt it to two different geometrical arrangements similar to those shown on Plate VII., Fig. 5, and Plate X., Fig. 3: the first a combination of right lines, the severe character of which will require a formal treatment of the flower; the second an arrangement of curves, and, therefore,

Fig 1.



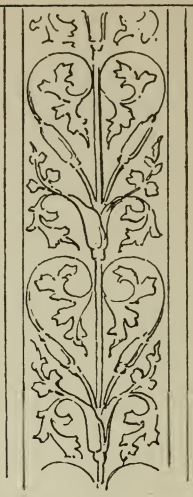


Fig 2.

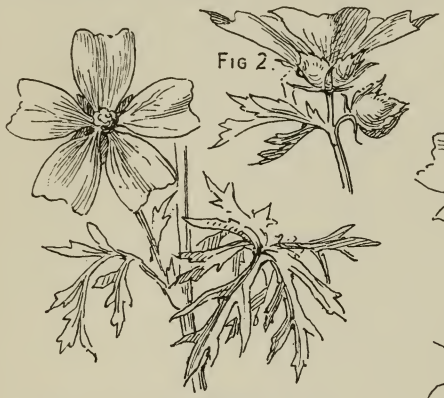


Fig3.

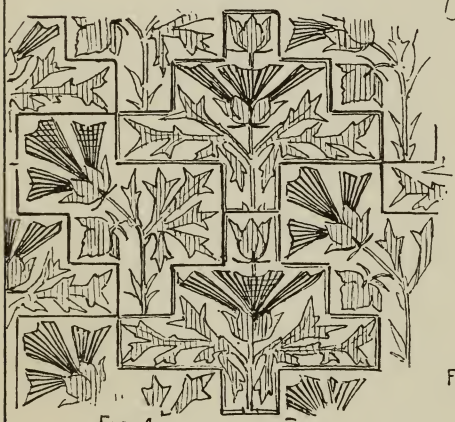


Fig 4.

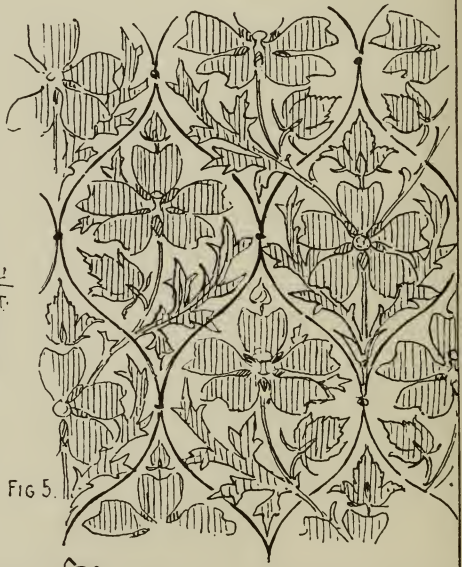


Fig 5.

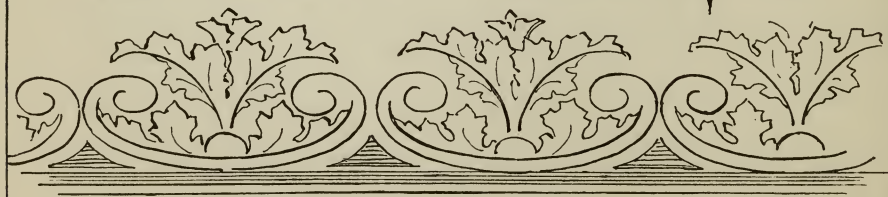
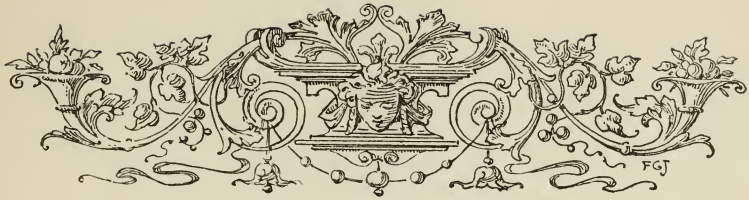


Fig 6

admitting of a freer treatment of the plant. The application is given on Plate XXIV., Figs. 4 and 5. Note that in the first design (Fig. 4), the flattened curves of the flowers and leaves in the natural representation of the plant (Fig. 2),* are rendered straight, in order to harmonize them with the severe forms with which they are associated, while yet the character of the plant is maintained, because the main features have been adhered to and emphasized. These may be thus enumerated: the indented ends of the petals, the serrated edges of the sepals, and the acutely lobed character of the leaves. In the second design (Fig. 5), observe that the lines forming the basis of the pattern, being composed of curves, do not require that the plant should be so greatly modified as in the former case; only a limited degree of formalism is required to harmonize it with the repetition of symmetrical curved lines. Hence it will be seen that in these methods of using natural forms, the one great essential is the power to grasp the charac-

* The leaves in the drawing are the upper ones, and are different to the lower ones, which are not shown.

teristics of the flower or plant it is proposed to employ, and, to acquire this, nothing but careful and painstaking investigation and careful drawing of plant form will suffice; hasty and superficial observation and careless drawing will only yield what will result in vulgar ornament. Too many people indulge the notion that for the conventional rendering of Nature, any kind of drawing will do. This is a huge mistake, for the highest kind of drawing is the life and soul of conventionalism. The attempt to excuse bad drawing, as is often done, by saying it is decorative or conventional, is about the lamest way of endeavouring to disarm criticism that has ever been evolved by a vain imagination.



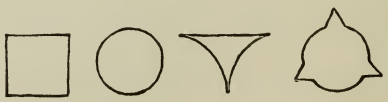
CHAPTER VI.

COMPOSITION.

HAVING called attention to the general treatment or conventional rendering of plants for decorative purposes in accordance with the two different methods observable in the records of historic Art, it will now be for us to explain certain laws necessary to the practice of ornamental compositions. Throughout the whole natural world there is perhaps no law so manifest as that of "Fitness," *i.e.* of adaptability of forms and structures to particular purposes. To say that this law should govern the production of industrial objects is but to repeat what is accepted as a truism; but while there are many people who will allow the importance of this law in formative matters, very

few recognise its importance in decoration. They see how necessary it is that an article should be made to serve its special purpose, but grasp not the application of the same law to its embellishment. Now if it is necessary that an article should be designed with regard to its fitness in use, it is equally essential that the ornament should be fitted for its allotted space. Mere application of ornament to a space is not sufficient; it should be adapted as perfectly as possible, for lines suitable for one form may be altogether wrong for another. Yet how often is this disregarded, ornaments being copied from one space and applied to one altogether different, without regard to suitability, the only thing regulating the procedure being the possibility of squeezing it into its new quarters!

To practically illustrate the application of this law in elementary design, let us assume that we have certain forms, such as the accompanying, given us to decorate. Common sense, as well as the recognition of the law of fitness, would enable us to decide against filling in these spaces in the same way.



The first question that will arise is, What direction should be taken by the lines of the ornament which is to occupy them? The lines comprising the boundaries of the figure should influence the direction of the lines for laying out the pattern which is to be included within the spaces. The leading lines should take the form of, or repeat, those of the boundaries; but if for some reason this cannot be done, then the minor ones should be made to do so. While, however, care is taken that lines should repeat those of the boundaries, so as to fit and compose with them, it must also be kept in mind that, to prevent monotony of effect, there are other principles to be regarded, such as contrast, etc., and that contrasting lines must therefore be employed. On Plate XXV. are given various ways of laying out these figures, agreeably to the principle of fitness, which involves the laws of repetition, contrast, and variety.

In deciding the directions which the leading lines should take, it is of the utmost importance that we should consider the character our design is to assume: whether it is to be a purely conventional or naturalistic

composition; whether it is to be based on the conventionalism of general ideas of Nature, or upon the realizations of particular plants. If the former, we may take any ornamental lines we choose, so that they compose well with their surroundings; but, if the latter, then the lines must be such that, while they are suitable to the space or form to be decorated, they must not violate the growth of the selected plant. Hence, while in this latter our selection of lines is limited, it follows that we must select our natural examples with care, and see that both conditions—adaptability of lines and adherence to plant growth—can be well fulfilled. Our lines must compose well, while the general growth of the plant must not be allowed to suffer. We must not have the stiff-growing plants adapted to flowing or spiral lines, nor the curvilinear growth of trailing plants stiffened into unnatural lines; for, by so doing, we should lose important characteristics, and miss the chief point upon which the individuality of plants depends. Take Fig. 1, Plate XXV.: the first lines put in are the vertical

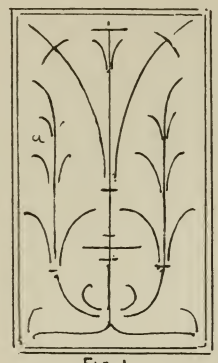


FIG 1

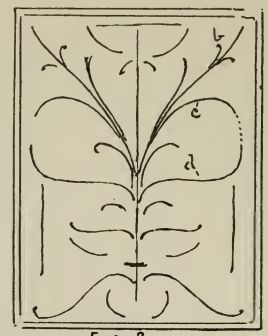


FIG 2.

FIG 3.

FIG 4.

FIG 5.

FIG 6.

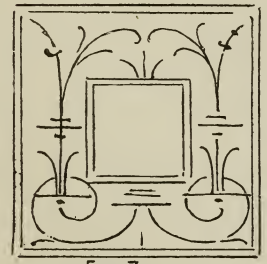


FIG 7.

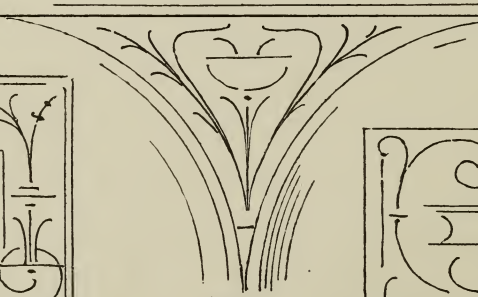


FIG 8.

FIG 9

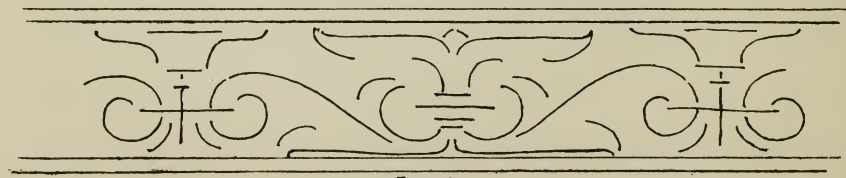
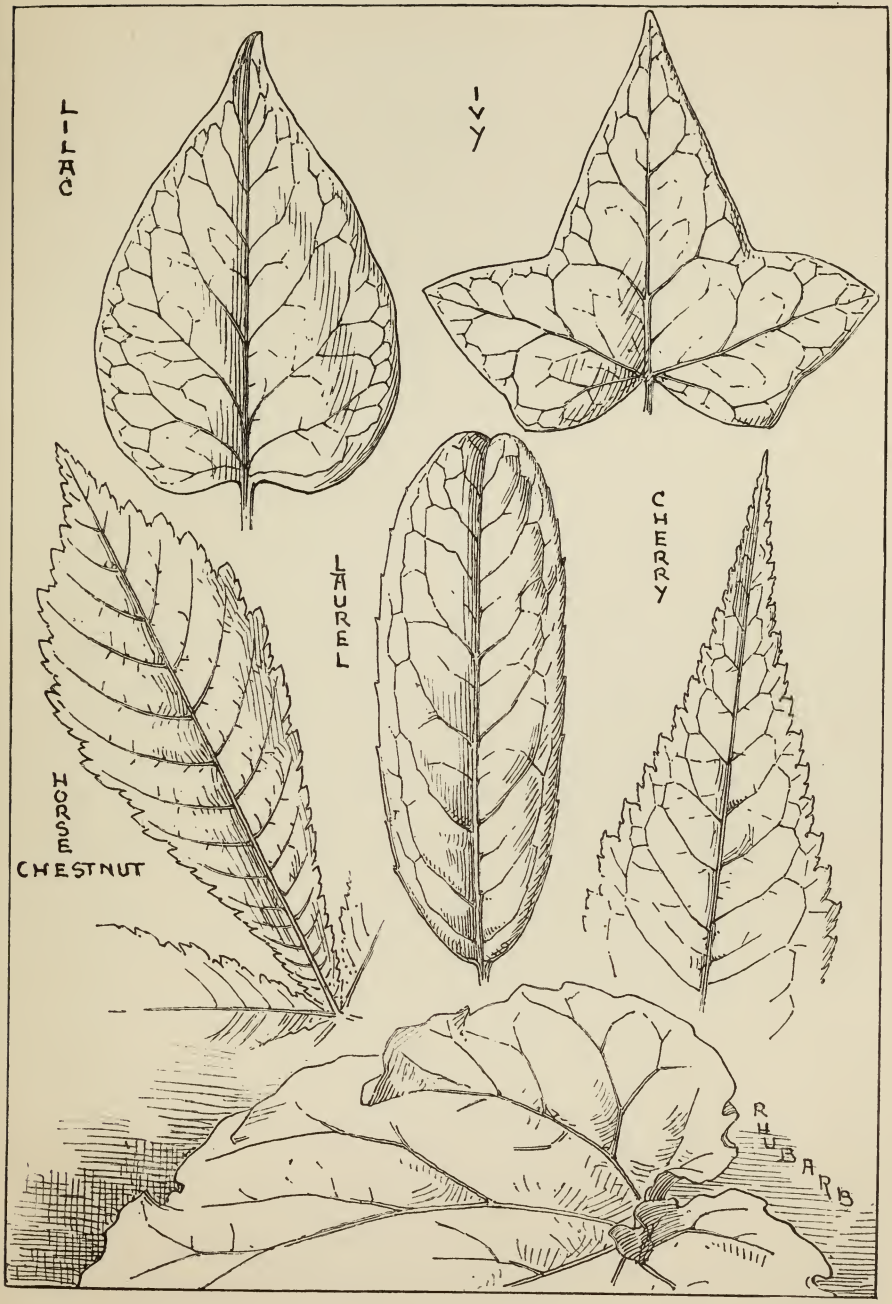


FIG 10.

ones, repeating the sides of the oblong, and varying in length; next, the horizontal ones, repeating those at the top and bottom of the figure; then, the two side curves, running from the central upright into the angles, are introduced for contrast. Fig. 3 shows a different arrangement. We start with a line in direct contrast to the sides of the rectangle, the contrast being further accented, and variety added, by the introduction of spiral lines, and the balance of principles is then effected by the introduction of short horizontal and vertical lines in the minor parts. Again, in Fig. 4 we have the central vertical line in contrast to the boundary line of the circular figure, while the curves accord with it; and so on with the other figures. Further, not only should some of the lines for spacing out be in accord with the circumscribing outline of the figure to be decorated, but the secondary lines that are to occupy the spaces formed by the first lines, should be influenced in their direction by the surrounding ones. Thus in Fig. 1, Plate XXV., the vertical line *a* is made to curve at its extremity, so as to harmonize, by similarity,

with the curve immediately above. The curve *b* in Fig. 2 runs, for the same reason, nearly parallel with the curve under the central horizontal line. This principle of fitness in the direction of lines is well seen in the veining of natural leaves as shown on Plate XXVI. Take for instance the lilac leaf, and note the sympathy between the direction of the principal veins and the curve of the outer edge. Although in the energy of growth they start in direct contrast, they gradually assume a curve similar to that of the margin of the leaf they decorate. Note also that the same harmony is preserved between the primary and secondary veins.

In order to further secure harmony and unity in a composition, it is necessary that lines should not only have a certain parallelism in their relation to one another, but also a continuity in arrangement; and, although lines may be interrupted, a common course or direction should be indicated. Thus the lines *c* and *d*, Fig. 2, Plate XXV., although distinct ones, contribute to unity of effect by having their extremities made to


LILAC
IVY
LAUREL
CHERRY
HORSE CHESTNUT
RHUBARB

take the same course, indicated in the figure by the dotted line; or as in the annexed illustration, in which the long curve 1 is parallel to the boundary of the

border, the termination of the spiral 2 is drawn so as to follow the trajectory of the line 3, as well as to repeat the boundary line. The same is done with line 4. Of course, when arranging lines in continuity, due regard must be paid to the spaces enclosed, which must be agreeable in form and quantity.

Equally important with the right direction and composition of lines is the proper distribution of those lines; that there may be a regulated balance between the lines themselves, and the masses into which they divide the spaces allotted to them. The distribution of lines and masses may result in equal or unequal spacing, as in the case of a diaper or a rich arabesque; and to most beginners the laws of "even distribution," as it is termed, will be more apparent in the former. Let us turn for a moment to the examination of natural leaves, to see what warrant there is in Nature for this

principle. Regarding veins as the surface decoration of leaves, we find that they are variously disposed. The surfaces of some of our most beautiful and familiar leaves are divided into large and small masses, bearing a proportional relation to one another. Take a "net-veined leaf" such as the ivy (Plate XXVI.), and notice how large a proportion of the beauty of this general favourite is due to the principle of even distribution. Observe, the veins do not equally divide the surface; on the contrary, they divide it into varying quantities, graduated and balanced so that there is an evenness in the arrangement. In some less beautifully decorated leaves of the "feather-veined" class, the surfaces are almost equally divided, giving to the surface of the leaf a monotonous effect by reason of the simple repetition of similar masses. This law of even distribution, to be rightly appreciated, in Nature or Art, should be viewed in the light of the fundamental principles of repetition, variety, and contrast. In the first-named class of leaves there is a balance of those principles resulting in the higher form of even distribution; but in the other class we have a lower

Fig 1.

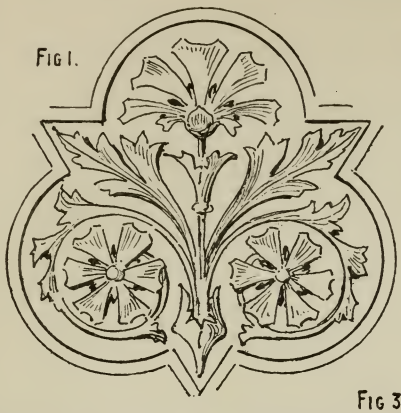


Fig 2.

Fig 3.

Fig 4

Fig 5.

Fig 6.

expression of the same law, less beautiful because the balance is disturbed by the preponderance of one principle—repetition. What has been said about direction, continuity, and composition of line, and the distribution of lines and masses in laying out a design, applies with equal force to the subsequent operations in the development of it. There must be the same care exercised and the same regard to principles shown, in completing the design and in adding detail, as in the earliest stage of arrangement. On Plate XXVII. are given some designs based upon the general lines given on Plate XXV., illustrating the application of the foregoing principles in the completion of patterns.

Further, this principle of fitness in direction of line and disposition of mass in the filling in of spaces, may not at first sight appear applicable to patterns of an "all-over" character, such as those used for paper-hangings, floor-cloths, and tiles; but a little consideration will show that it equally applies to design of this class, and that it is of importance in securing character. Patterns of this kind, which depend so much upon repe-

tition, require building up on a geometric basis. The adoption of different forms will lead to a variety of lines in the filling in. Take, for instance, the examples given on Plate XXVIIA., the square, Fig. 1. Here the *leading lines* of the pattern are horizontal and vertical, repeating the boundaries of the figure. In using the circle as a foundation figure, the main lines of the design consist of circular curves (*see* Fig. 2). The use of the diamond as a constructive form introduces oblique lines, giving to the pattern based thereon a different character to the two preceding ones (Fig. 3). In Fig. 4 we have a design arranged upon a basis of figures composed of ogee lines. Here again it will be seen that the *principal lines* are in harmony with the adopted form. Of course it is open to the designer to limit his filling in to one figure, or to run his lines into several figures—to keep the design simple or complex, according to circumstances. Again, the original form on which the design is based may be retained and emphasized, or it may be abolished altogether when the pattern is completed. The course to be adopted will depend on the purpose to which the design is to

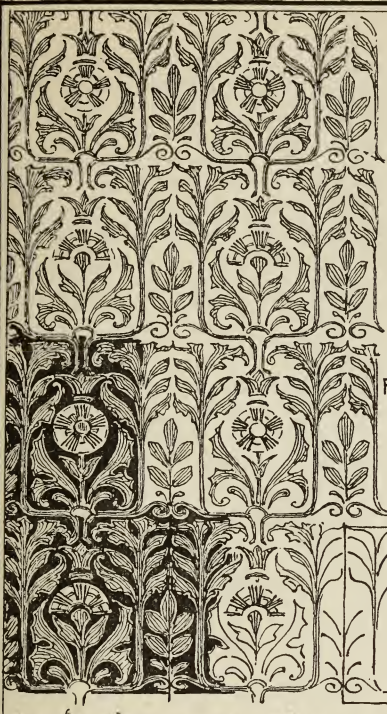


Fig 1.

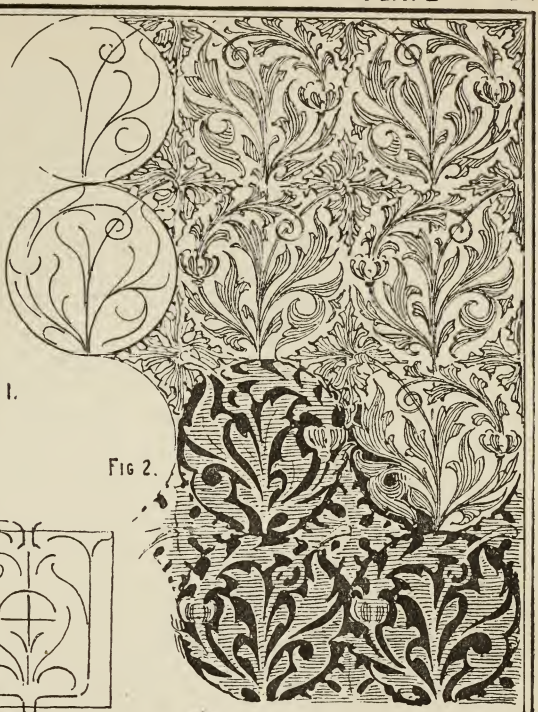


Fig 2.

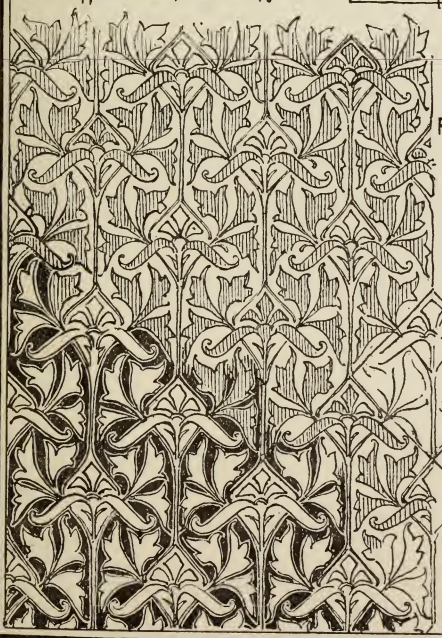


Fig 3.

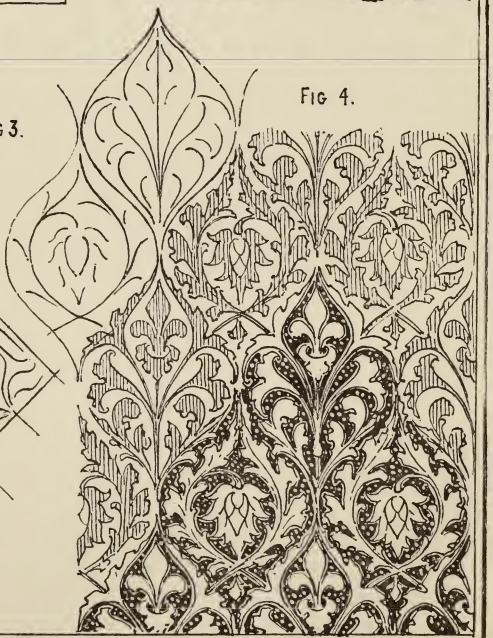


Fig 4.

be applied; if the design is intended for a dado paper, it will be better to retain the constructive forms, because they will give it a stiffer and stronger look, rendering it more suitable for its purpose; but if for paper to be used above the dado, then it may be judicious to dispense with them, as a more easy and flowing pattern will best accord with the position it is to occupy. Here, while speaking of wall-paper, it may be well to call the student's attention to one of the difficulties he will meet with in designing for this special purpose—*i.e.*, the arrangement of his pattern to suit the method of reproduction. Wall-papers are printed from blocks, and they vary in size from eighteen to twenty-two inches square; but most English wall-papers are printed from blocks twenty-one inches square.

To practically space out the pattern, therefore, it will be necessary to adjust the number of fundamental forms or repeats to the square of the block, so as to ensure perfect repetition in a vertical direction in the printing of the piece, and correct joining of the pattern in a horizontal direction, when the pieces are hung

side by side. To effect this it will often be found necessary to alter the proportion and size of the constructive figures selected. A little practice in developing forms on squared paper will soon put the student in possession of many characteristic shapes available for his purpose.

On Plate XXVIII. are given the designs to further illustrate the principles of composition. Fig. 1 is an "all-over" pattern suitable for textiles, the elements of which consist of brush forms; Fig. 2 is an upright border, also made up of brush forms; Fig. 4 is a design for a curved border, composed of similar materials; Fig. 3 is a horizontal border, the details adapted from the dahlia.

Here it will be well to explain certain terms used by ornamentists, such as "alternation," "counterchange," "interchange," "eurythmy," "simplicity," and "complexity." These terms have been adopted to describe certain applications of the fundamental principles, and not as defining or indicating any new laws. For instance, "alternation" is a particular application of the

FIG 1

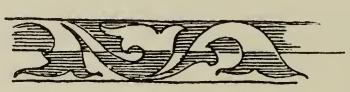
FIG 2

FIG 3

FIG 4

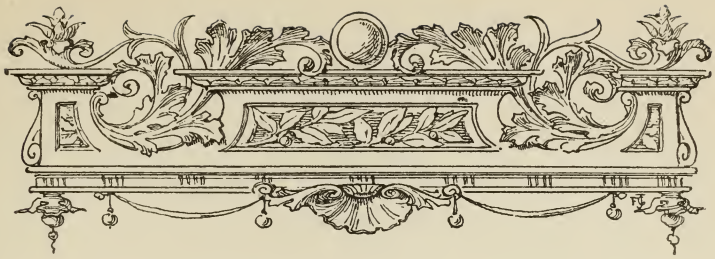
principles of repetition and variety, and may also involve contrast, thus: 

In the first we have an alternate repetition of a similar form, but varying in size; in the second an alternate repetition of contrasting forms. Again take the terms "counterchange" and "interchange." These, it will be found, are but varieties of the application of the same principles. By "counterchange" is understood the arrangement of a pattern in such a way that itself and the ground shall be of the same form  , showing at once that it is but a special way of employing and emphasizing the law of repetition. "Interchange" is nothing but the expression of variety and contrast by tones and colour after the manner observed in heraldry, from which, no doubt, the idea was taken. In heraldry it is a law that colour must not be placed upon colour, or metal upon metal  ; so that a charge or device must be of gold or silver if the field or ground on which it is placed is coloured, and vice versâ. When, however, the field consists of more than one colour, then we find parts of the device

or charge are interchanged with the ground; thus the colour of the dexter, or right, side of the  shield is interchanged with that portion of the charge placed on the sinister side, while the metal of the sinister side is interchanged with the other portion of the charge. Sometimes, however, the field is divided horizontally as well as vertically; then the interchange becomes more complex, but the same rule is observed. This special application of contrast and variety is often valuable as a means of enriching a simple design without altering the lines upon which it is based or constructed.  The term "eurythmy" is used to denote a succession or repetition of varied forms in ornament; it may be alternating or interrupted. To put it into simple words, it is repetition with contrast or variety. Simplicity in design is that quality which arises from the simple arrangement of elements; and where it exists, the order and method of composition are at once apparent. It is the leading characteristic of some kinds of ornament, while in others it belongs to the earlier phases only. Complexity is the reverse of simplicity,

and depends upon intricacy of arrangement ; and it produces richness by an ordered multiplicity of lines and forms. It should be observed that the history of Art furnishes two forms of this principle, one being a deliberate complex arrangement of parts for a distinct purpose, the other being the accidental result of indifferent composition, in which details are huddled together to obtain an effect of richness. This latter form is always to be found in the decadence of a style. Let the reader refer to examples of Saracenic Art of the best periods, and to late Renaissance like the Louis Quinze, and he will see at once the difference between the intentional and accidental forms of this principle. While complexity is associated with richness, it must not be supposed that simplicity is synonymous with poorness and poverty of design, for such is not the case ; it is rather the outcome of directness of purpose and the desire for purity and refinement. True simplicity in a design is often more difficult of attainment than complexity, for the fewer the parts the more thought and care will be required in their arrangement.

These two principles, when rightly understood, can be legitimately employed in the same scheme of decoration, each setting off the other. While decoration as a whole should be distinct, the occasional introduction of the contrasting element of mystery, which complexity supplies, gives it an interest and a charm almost inexplicable. The preponderance of complexity in any scheme would be irritating and wearisome. This is often felt when viewing examples of Oriental Art, beautiful as they are; and one pines for passages of a restful character, that the mind may be relieved of the perpetual task of unravelling artistic puzzles. Besides the employment of complexly arranged details for setting off, by contrast, simple ones, there is another condition connected with their use which should be borne in mind, viz., the positions they ought to occupy with regard to the spectator's eye. Obviously, a complex pattern, placed at a considerable distance from the eye, would present a confused appearance; while much of the labour bestowed upon the construction would be entirely lost — simple patterns being better suited for long distances.



CHAPTER VII.

ACANTHUS FOLIAGE.

ACANTHUS foliage being an important element in the great styles of ornamental Art, it is thought well to devote an entire chapter to its consideration. The study of it will be found both interesting and instructive.

The term "acanthus" is used to denote a class of conventional foliage, and not any particular kind based upon the natural plant of that name. A careful examination of the history of Art shows it to be, not an imitation of Nature alone, but a development combining the inventive and imitative principles; suggestions from Nature being added to inventive forms generated by the use of the brush. That the fully developed acanthus is not based upon the direct imitation

of a natural leaf will be placed beyond doubt if a comparison be made between a natural leaf and an ornamental one, for, in the one case, we have the veins diverging abruptly and directly from the mid-rib, whereas in the other, they, in common with the mid-rib itself, *radiate* from the base of the leaf. Now the principle of radiation lies at the root of the whole matter; it is, in fact, the great underlying principle of the acanthus and of all ornamental foliage whatsoever,—a principle which found expression in the early and remote periods of Art. The acanthus of later Art is built up, so to speak, upon the various forms invented and handed down to modern times. Turning, for example, to Assyrio-Persian Art, we shall find recorded amongst the remains of that decorative system a beginning of this foliage,—an initial attempt to construct, out of simple forms which already existed, the ornamental element which entered so largely into subsequent styles. Take the simple palmate form, Plate XXIX., Fig. 1, a combination of brush forms radiating from the base. Turn to Fig. 2, and we have the same combination of forms, but brought

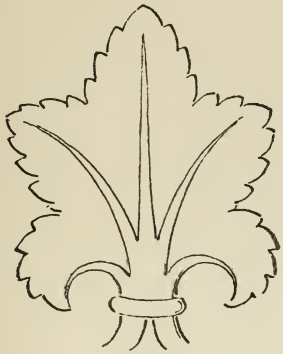


Fig 3.

Fig 1.

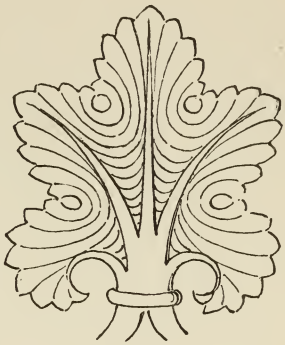


Fig 4

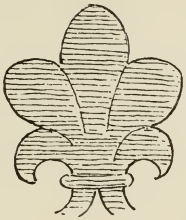


Fig 2.

Fig 5.

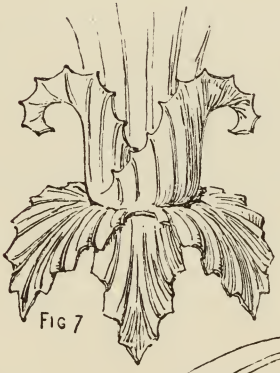


Fig 7

Fig 6.

Fig 8

closer together. Here the likeness to a leaf is at once apparent, and, no doubt, this fact struck the originator of the pattern; and so, in his desire for further elaboration, he referred to Nature, and added the serrations to the edges of the forms, marking each lobe with a central rib radiating from the base (Fig. 3). Further investigations of natural-lobed leaves caused him to observe that the parts were looped together, and so he joined the lobes. Again, seeing that under the loops in some natural leaves there existed an excess of material, causing a swelling of the surface, this he endeavoured to express by a series of curved lines following the form of the loop or eye (Fig. 4). In other examples we find that this fact was rendered by lines running down from the loop towards the base, as in later historic examples (Fig. 5). Now some such elementary beginnings of the acanthus were taken up by the Greeks, who refined, and developed still further, this decorative detail. At first they took these somewhat crude forms, contenting themselves with perfecting and improving them, without any material alterations of the facts and principles involved;

so that, in the earlier Greek renderings, we find that most care was bestowed on the improvement of the quality and composition of the linear details, these being brought as near to perfection as possible. In process of time, however, the results, refined and elegant though they were, did not entirely satisfy the artistic mind; and so we find new characteristics introduced, based upon further observation of Nature,—such, for instance, as variety in the sizes of the serrations, and gradation according to the general form of the lobe so enriched. Here then we have a distinct advance towards the final development of the acanthus, as a reference to the figures on the lower part of the plate will show. A still further development of this foliage was brought about by an alteration of the leaf edge. In place of the simple and somewhat monotonous serrations that hitherto prevailed, was substituted a richer system, which embraced a greater amount of variety; and hence we have the general character of the foliage completely revolutionized. Its inventive origin is to a great extent obscured, and it becomes more naturalistic, giving colour to the mistaken notion

FIG 1.

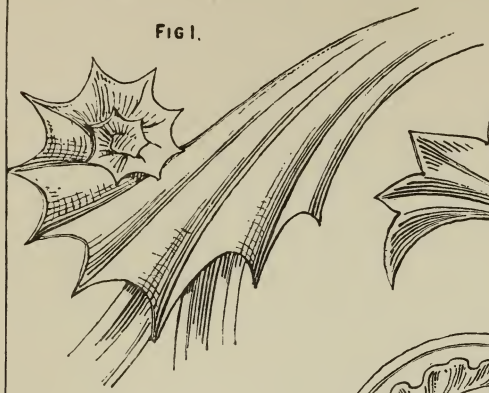


FIG 2.

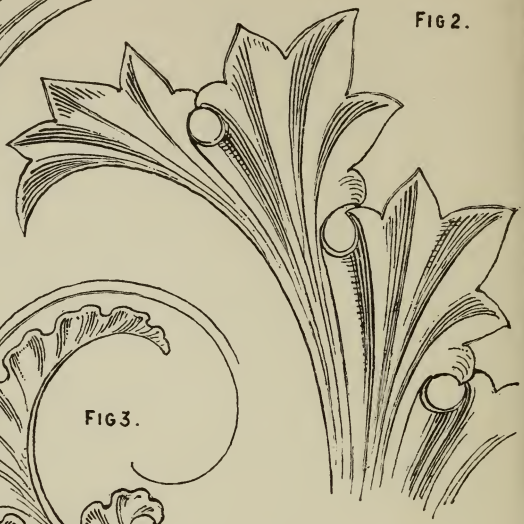


FIG 3.

FIG 4.

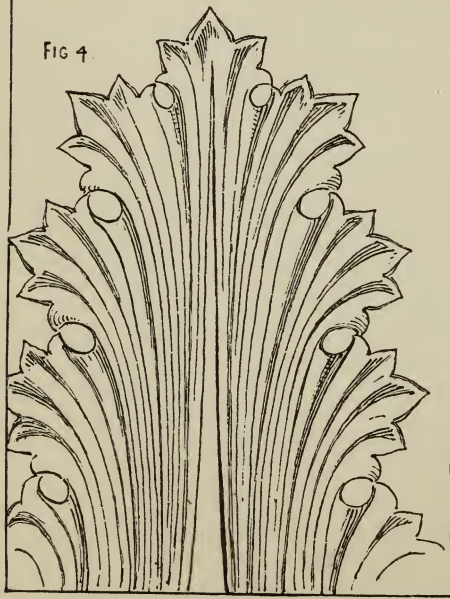
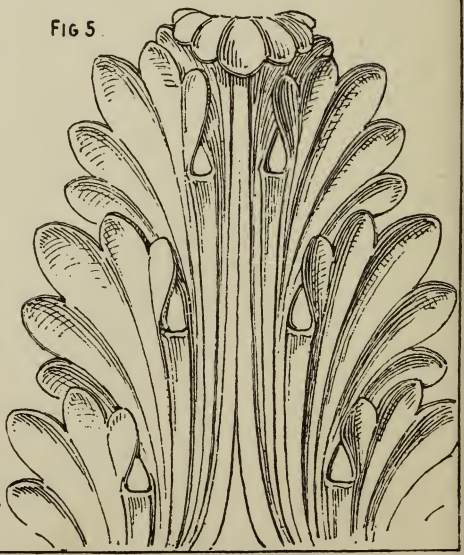


FIG 5.



that it is a rendering of certain individual natural leaves (Plate XXX.). So far we have seen that the rudimentary forms of acanthus, similar to those appearing in the late development of Assyrio-Persian Art, were adopted by the Greeks, and improved upon by the enrichment and gradation of the leaf edge, the better expression of the pipes, and the general refinements of its form. As regards the edge of the leaf, first, the tines of the serration are equal in size; in the second stage of development they are made unequal in size, and graduated according to the general form. Now, in the Roman period of Greek Art we shall find that the lobes became subdivided, and each portion serrated, while the serrations are of a different type altogether. In the earlier forms of acanthus two distinct varieties may be noted, the angular and the rounded (*see* Figs. 4, 5, 6, and 8, Plate XXIX.; and Fig. 4, Plate XXX.). The rounded form is the one from which the so-called olive acanthus was developed (Plate XXX., Fig. 5). This in turn was elaborated by the Greco-Roman artist into what is known as the soft acanthus (*see* Plate XXXI., Figs. 3 and 4). The realization of the last form of

acanthus was not sudden but gradual, as was the case with the other forms which preceded it (*see* Figs. 1 and 2, Plate XXXI.). In Fig. 1 we have the leaflets composed of oviform lines, regularly disposed. In Fig. 2 (*a*) the lines are waved; at *b* the concave part of the waved outline becomes indented, suggesting forms of foliage similar to the other examples given on the same plate, and furnishing the connecting link between the simple olive and the enriched soft acanthus. Another matter should be noticed in connection with ornamental foliage of this class, and that is the surface modelling. It will be observed that this is generally determined by the outline of the leaf: if angular, the surface is acutely channelled; if curved like the olive acanthus, it is moulded with concave markings; while, if like the fully developed soft acanthus, it becomes undulating and complex (*see* Plates XXX. and XXXI.).

We may now summarize the different features of this foliage. The essential parts of a fully developed acanthus leaf are: the lobes or leaflets, serrations or tines, eyes, pipes, and ribs or stalks; the various

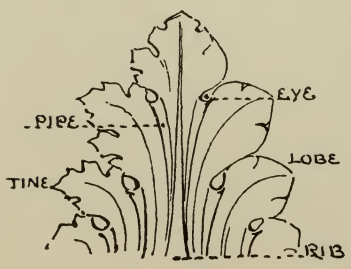


FIG 1.

FIG 2.

FIG 3.

FIG 4.

FIG 5

FIG 6.

details being developed thus: (1st) the edge of the lobes (*see* Figs. 1, 2, and 3); (2nd) the eyes and pipes, which underwent a change no less remarkable (*see* Figs. 4, 5, 6, 7, and 8). The form of the ribs varies but little, but the central one is most pronounced. With this single exception, it will be found that the ribs are less accented than the pipes, and in that respect an ornamental leaf differs essentially from a natural one. In Fig. 4, Plate XXXI., will be found an ornamental element to which some allusion should be made, viz., the terminal flower or rosette, used for various purposes. In this case it consists of an assemblage of leaves of the acanthus type, but, like the foliage accompanying it, it has gone through a series of developments before attaining this precise form; the earliest condition being a simple disc, afterwards enriched by subdivisions, foliated thus:

1 2 3

4 5 6 7 8

1 2 3 4 5 6

and so on. Now, in beginning to draw and design this kind of ornament, we have first to consider the general form which is to regulate the composition, because that will determine the graduation of the leaflets and the directions of the pipes. If we begin with upright leaves, note that they may assume various general shapes, according to the purposes to which they are to be applied. In all these cases lines should

1 2 3 4

be drawn nearly parallel to the outline, and upon them the eyes or loops that join the leaflets should be placed; the distance between each should be determined by the character of the outer boundary of the leaves; the distances should be greatest at the widest part (*see* Figs. 1 and 3). Where we have the widest leaflets at the base, the other leaflets diminish upwards in size. In Fig. 2, the sides of the leaf being for the most

part parallel, the leaflets are even in size, and consequently have little gradation. In Fig. 4 the largest leaflets are at the top of the leaf, that being the widest part; the others graduating downwards. Again, in drawing the pipes, due attention must be paid to the space available on the surface of the leaf. In Fig. 3 there is ample space, and so, in order that they may be evenly distributed, they are turned slightly outward. In Fig. 2, where the room is restricted, the pipes are brought down parallel to the sides; while in Fig. 4, for obvious reasons, they converge towards the base of the central rib. Now draw in the ribs of each leaflet, and determine its general shape; this done, the next thing is to settle whether the serrations are to be simple or complex in character, and whichever is decided upon, the lines will be determined by the rule which regulated the size of the leaflets. It must, however, always be borne in mind that the central mass of the leaf and the central mass of the leaflet should preponderate over those of the sides. All the examples given represent the leaflets as touching each other. We have now

to draw the reader's attention to certain changes that will occur when the same view of leaves is represented in a curved condition, as the leaflets will necessarily alter, overlapping and separating according to the direction of the curvature. To clearly demonstrate this, take a piece of card-board, not too thick, and cut it in this form,  dividing it into lobes with a penknife, and then curve the two sides inwards, and the upper part downwards and forwards. It will then have this appearance,

the leaflets overlapping one another. This may occur in two different ways: either the lower edge of an upper leaflet may overlap a lower one, as at L, or the reverse, as at R. Now turn the sides outwards, curving the mid-rib forward, and we have these leaflets separating thus:

Hence, apart from the elements comprising the leaf, we have brought to bear upon it certain conditions that materially affect its character. These conditions of curvature may, as we shall see in the next example, be not only simple, but com-

pound. In this Fig.  the mid-rib is bent in two directions, concave above and convex below; the sides being turned backwards (except the upper part, which is curved forward). Thus we have enriched the general character of the leaf by the closing of the lower leaflets and the separation of the upper ones. This may be still further increased by curving its surface in a greater number of ways.

So much for this foliage as affected by curvature. Now a word or two about the leaf edge. It is a common fault with designers to use the forms of foliage as found in Classic Art, reproducing them over and over again, without reference to the source whence the old masters drew their inspiration, until they become lifeless transcripts of the originals. The forms are thus brought into disrepute, and grounds for the sweeping condemnation of ornamental foliage are afforded to that large class of critics who are unable to comprehend the true position of conventional Art. Now if we are to keep our acanthus foliage fresh and bright, our practice should be brought

into harmony with its history by constant reference to Nature; not for the sake of any mere novelties of form we may find, but for that inspiration which alone can give to our work vital force and freshness. The commonest plants, if carefully studied, will yield an almost endless number of suggestions or ideas. On Plate XXXII. is given a number of leaves drawn from Nature, all of which can be used in the construction of acanthus foliage. Now in using natural forms we must regard them as *suggestive* models, and not as models to be imitated. The irregularities of Nature must be reduced to *order* by observing the *intended* order of Nature, so that they may be brought into perfect harmony with the conventional forms with which they are to be associated. If in the natural leaf selected for use we find that, as a rule, the serrations are simple, that fact is the one we have to grasp and apply; any thing we discover that is contrary to the general habit of the plant must be discarded. For instance, there are plants whose leaf edges are simple scallops  but occasionally examples may be met with  in which a form like this occurs:


Fig 1.
Fig 2.
Fig 3.
Fig 4.
Fig 5.
Fig 6.
Fig 7.
Fig 8.

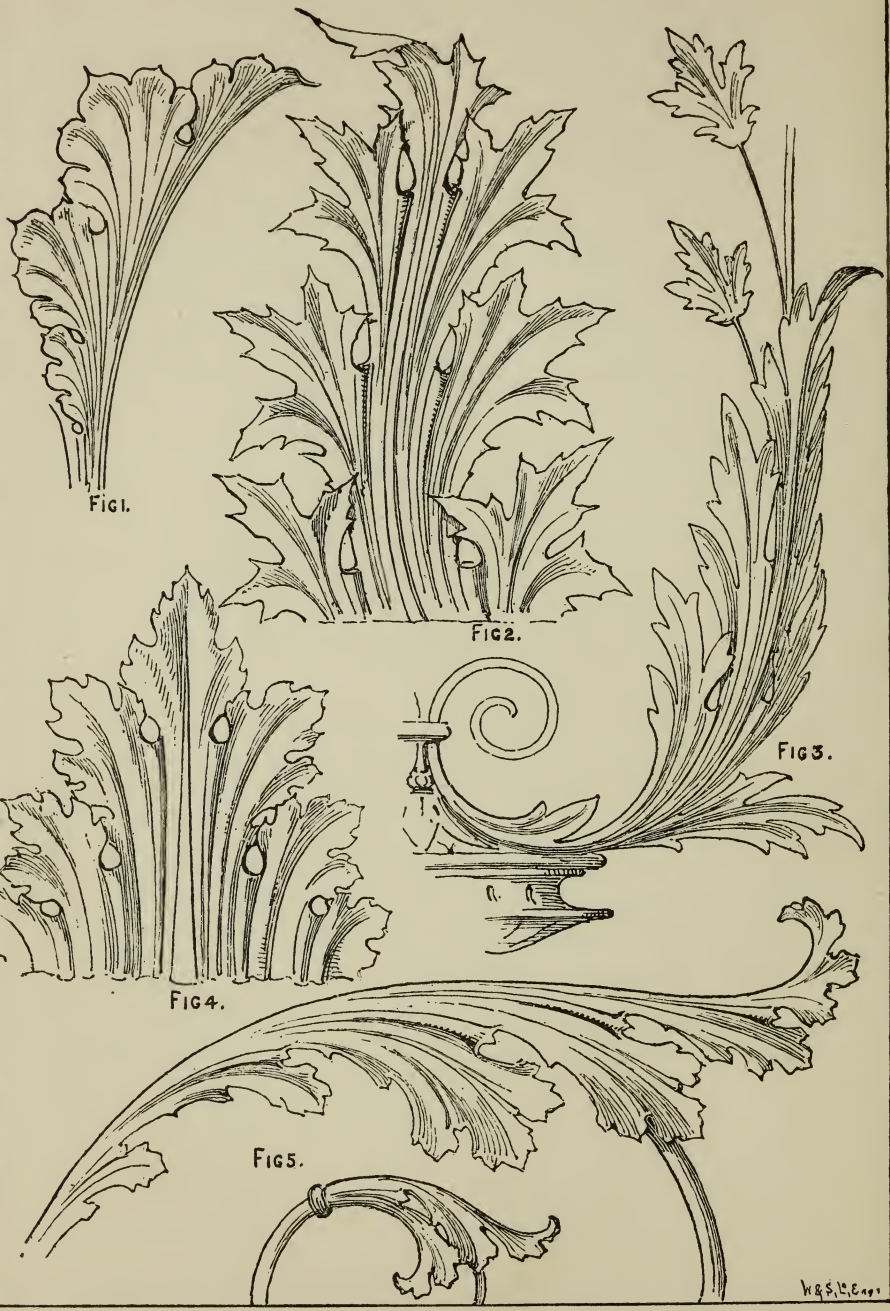


FIG1.
FIG2.
FIG3.
FIG4.
FIG5.
W&S.Lt.Engr.

and again there are other leaves having richer edges, in which the serrations are, as a rule, in groups, thus:

This arrangement, being the prevailing one, should be adopted throughout, notwithstanding that we may find exceptions occurring in other specimens of the class. Now let the student turn to Plate XXXIII., where a few examples of the method of adopting natural suggestions for the formation of ornamental foliage are given to further illustrate the foregoing remarks. Fig. 1 is the adaptation of the edge of the gooseberry leaf given on Plate XXXII., Fig. 3. Fig. 2 is an ornamental constructed leaf embodying the leaflets and serrations of the thistle drawn on Plate XXXII., Fig. 4. Fig. 3, suggested by the leaf of the buttercup. Fig. 5 is a rendering of the common groundsel, shown on Plate XX., Fig. 9, the "eye" being an ornamental expression of the form of loop occurring between the lobes of the same natural leaf.

Now taking up the thread of our historical review of the acanthus: we have seen how gradually the decorative element was developed until it culminated in Roman

Art; it remains to show what further changes it underwent in later times. The acanthus naturally suffered degradations in the decadence of Classic Art; but it had a revival, and, as we shall see, it underwent a new series of developments. The old Classic forms were, as nearly as could be, adopted in the first instance, and were gradually elaborated, but upon altogether different principles, which produced results of a very distinct character, rivalling the Classic in all its varied forms of richness and beauty. The earliest results of the endeavour to revive the Art of the past, bore but a faint resemblance to the original forms intended to be produced: necessarily they were crude, unfinished, and incomplete. The elaboration of these forms was carried on in many parts of Europe far removed from the places where ancient Art had flourished, and so the workmen of the revival had no examples to guide them in perfecting the traditional forms adopted. They were thus thrown on their own resources for methods of enrichment and development. Our own Gothic styles, which grew out of the Romanesque, will furnish illustrations of the new process of development. For

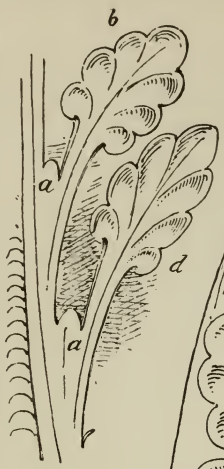


Fig 2.

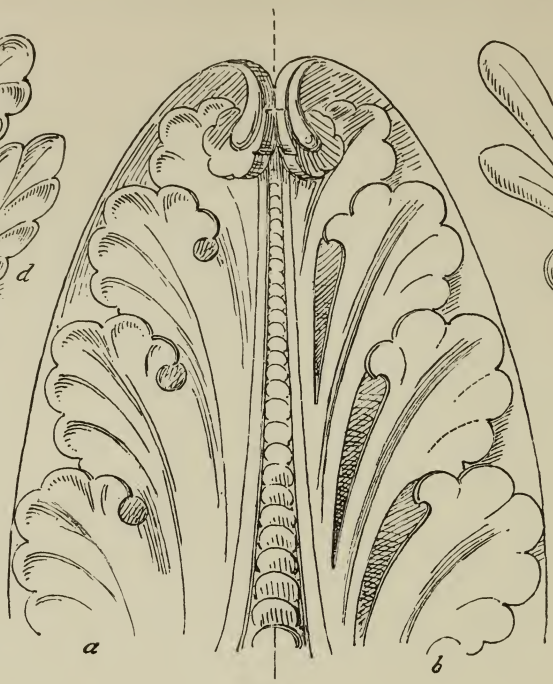


Fig 1.

Fig 3.

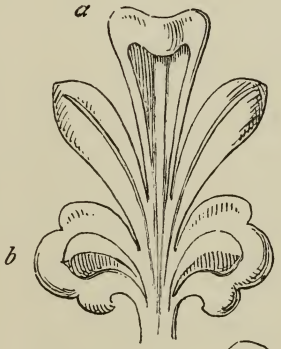


Fig 4.

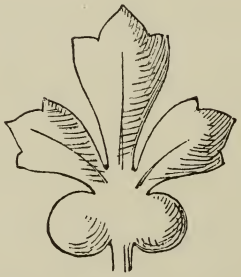


Fig 5.

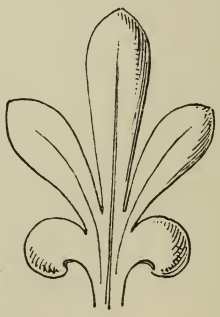


Fig 6.

Fig 7.

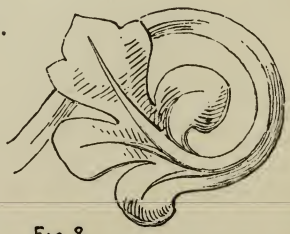


Fig 8.

instance, in the Anglo-Norman, we have leaves as on Plate XXXIV., Fig. 1, *a*, which clearly exhibits its Roman origin in the rounded form of its leaflets, as distinct from the angular character of the Greek. Now in this leaf there are a certain breadth and smoothness which did not exist in the ancient Classic. This was soon felt by the revivalists to be a serious artistic defect, and they set about its correction. Being, however, unacquainted with the Classic method of dealing with the matter, which, as we have seen, consisted of the introduction of a strong pipe running down from the eyes, they took an independent course of their own by boldly deepening the eyes and cutting them nearly to the mid-rib, giving the work the appearance of an assemblage of leaves branching from a central stalk—a result at once effective and original (*see* Fig. 1, *b*).

Here, then, we have a new point of departure from the more ancient practice. The effect of branching by cutting down the eyes to the mid-rib no doubt caught the fancy of the artist; and so, looking at Nature's method of branching, he put in the axil between

the leaf-stalk and the central one, an alternating form (*see* Fig. 2, *a*, *a*). Again, further developments took place in the leaflets, in the arrangement and treatment of the edges. First, the general form and the scallops on the edge took a more elliptical shape (compare *d* with *b*, Fig. 2). The next process appears to have consisted in cutting down from the edge of the leaflet towards its base, and separating the parts into lobes. The spaces between them were gradually increased (*see* Figs. 3 and 6). The lower lobes, it will be seen, have a form distinct from the upper ones. Its origin is distinctly seen in Fig. 1. The process of subdivision being carried thus far, attention was directed to the edges of the lobes and the surface modelling, the leaflets being made richer by the addition of a greater amount of variety. Thus, instead of the plain form of lobes into which the leaflet is divided, as in Fig. 6, we find the lobes become changed both in outline and in the contour of their surface (*see a* and *b*, Fig. 4). It will be noticed that, in place of the simple curved surface of the former example, there is in the latter an alternating succession of concave

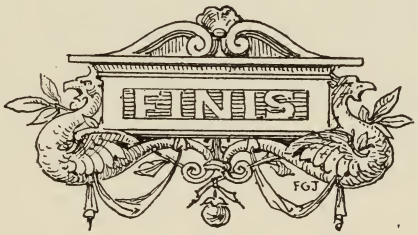
and convex markings of its surface, with the addition of sub-lobes as at *b*, and a strongly marked stalk running up the central lobe.

At this period inventive developments reached their climax, and once more Nature was directly referred to for ideas and further amplification. Changes were made in the direction of naturalism; the Early English leaf (Fig. 6) was transformed, as in Fig. 5. To the upper lobes were added serrations similar to those of the maple or hawthorn leaf; while the lobes at the base become mere knobs—simple developments of the curved or hooked lobe of Fig. 6. This latter feature was ultimately given up, and the leaf became more and more naturalistic. The ineffective character, as decoration, of simply copied natural leaves, was soon felt, and it was found necessary to relieve their surfaces in some way, so as to secure a certain play of light and shade; the surfaces were "domed" up (*see* Fig. 8) after the manner of beaten metal-work, which they closely resemble. Later, this characteristic became greatly modified, as more skill in the treatment of natural foliage was attained. Imitation of Nature was

carried as far as possible, and the idea of making pictures of natural leaves in stone predominated over the decorative adaptation of them. This finally led to looseness of style and mere prettiness of effect. This fact, no doubt, forced itself upon the attention of the Art-workers of this period, for at the end of the fourteenth century we find indications of a desire to return to a more conventional system, as shown in their attempts to give a stiffer and squarer character to foliage generally. In the next period this desire was realized, and foliage became once more conventional in spirit and character.

Here we must pause—not that we have reached the end of the subject, but because further inquiry would carry us beyond our present limits and the requirements of an elementary treatise. The purpose held in view was to show the gradual development of acanthus foliage, and how far the inventive and imitative principles were concerned in its composition. This has been done; and, in addition, we have offered a few suggestions for the construction of fresh forms of acanthus, and indicated somewhat briefly how the

mediævalists treated the traditional foliage of Roman Art—which treatment resulted in a new order of ornamental foliage. To point out the characteristics and varied forms of acanthus which the subsequent revival of Classic Art developed, would occupy far too much space; and, although a consideration of the numerous varieties would be interesting, it would not serve to illustrate any important elementary principles, other than those already enumerated in tracing the rise and progress of this ornamental detail.



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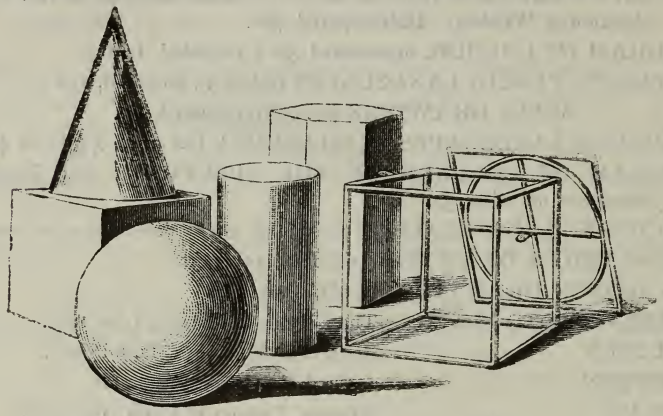

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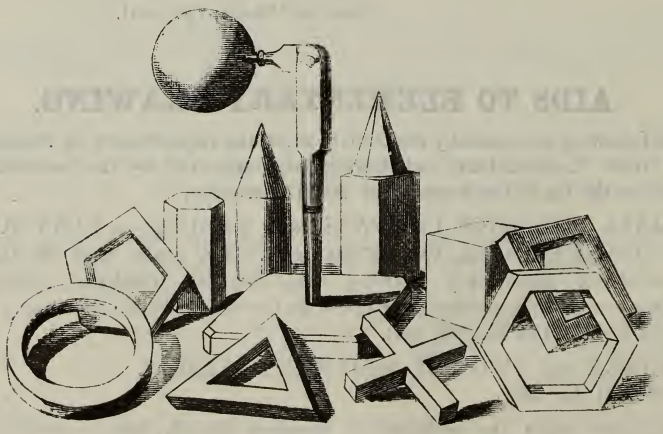

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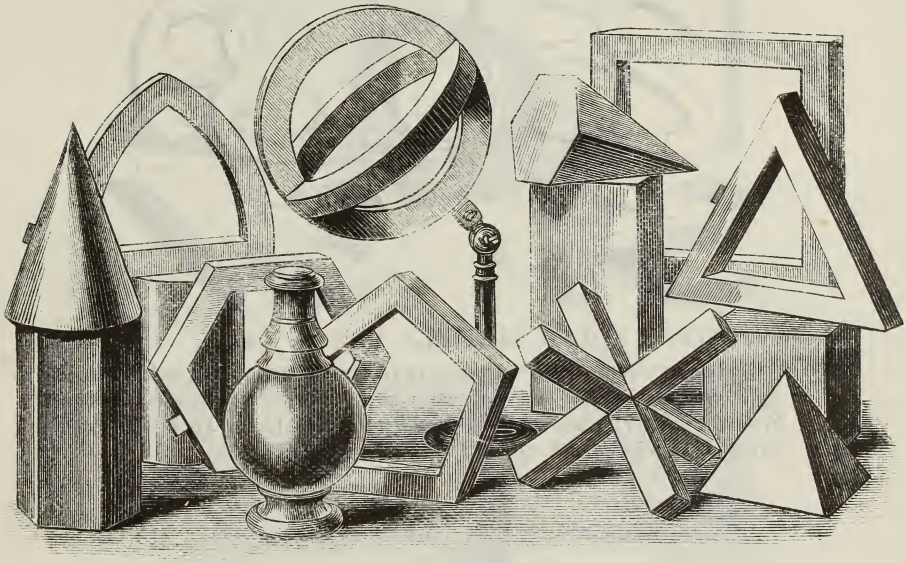

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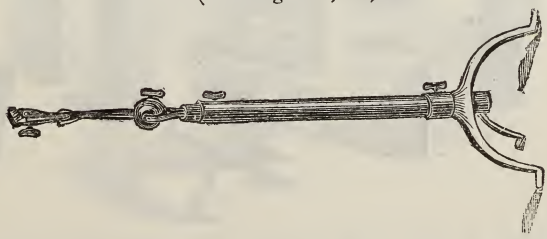

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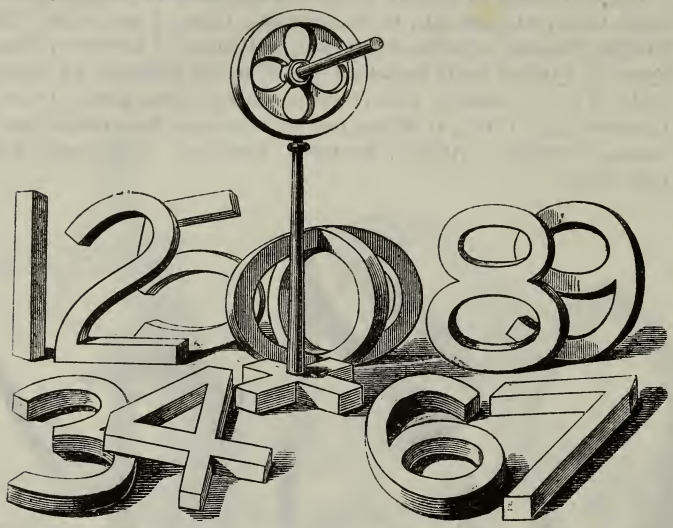
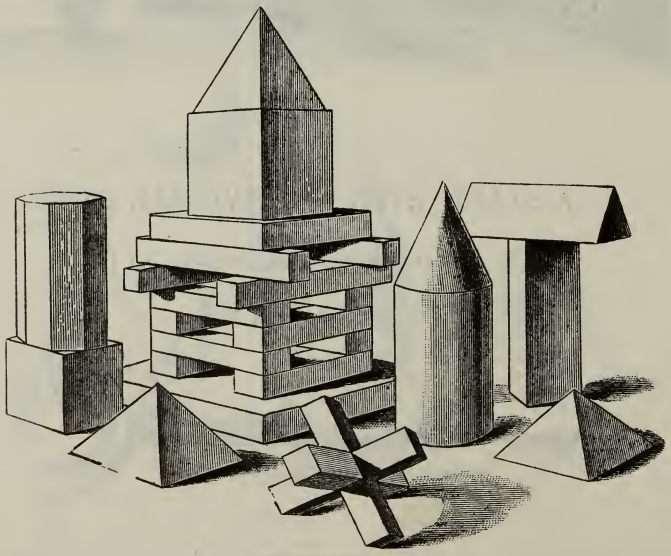


*DAVIDSON'S SOLID MODELS, in Box, £2.

Containing two Square Slabs, one 14 inches square, one 10 inches square; eight Oblong Blocks (steps); two Cubes; four Square Blocks; Octagon Prism; Cylinder; Cone; Jointed Cross, 12 inches high; Triangular Prism; Pyramid, Equilateral; Pyramid, Isosceles; Square Blocks.



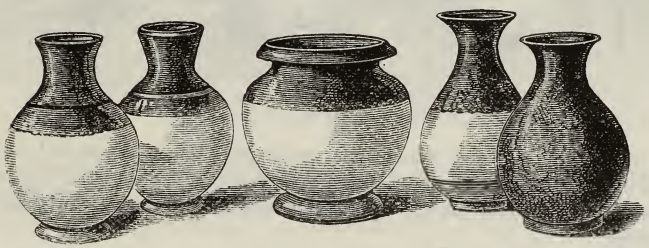
* Models, Vases, Diagrams, &c., entered as sets, cannot be supplied singly.

10-INCH SKELETON CUBE in wood, 3s. 6d. (Packing case, 1s.)

18-INCH SKELETON CUBE, in wood, 6 pieces, 12s.
(Packing, 1s.)

*THREE OBJECTS OF *FORM* IN POTTERY, 18s. 6d.
(Packing case, 2s.)

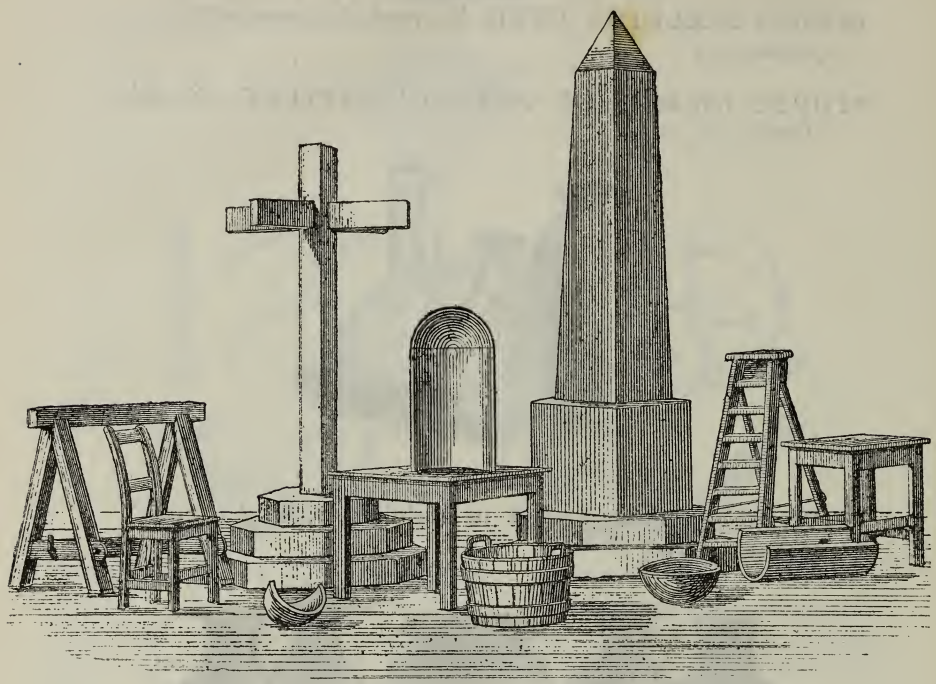
*FIVE SELECTED VASES in Majolica Ware, £2 11s.
(Packing case, 4s.)



*THREE SELECTED VASES in Earthenware, 18s.
(Packing case, 2s.)

* Models, Vases, Diagrams, &c., entered as sets, cannot be supplied singly.

*ELLIS A. DAVIDSON'S ADVANCED DRAWING MODELS.



The Models are of large dimensions, rendering them well adapted for use in Schools of Art and other Public Classes, affording excellent practice for the study of Object Drawing, and for the application and illustration of the principles of Perspective.

Most of the objects are composed of separable parts, and, as these are put together during study, the method of first drawing those portions on which the forms and positions of others depend, is inculcated; and at the same time each complete object is rendered more portable than it would otherwise be.

The individual models composing each subject may, of course, be variously combined according to the wishes of the teacher, and the complete objects may be drawn from numerous points of view; thus affording a varied series of studies in Form, Grouping, Light and Shade, &c.

The following is a brief description of the models:—

1. An Obelisk, composed of—
   - 2 Octagonal Slabs, 26 and 20 inches across, and each 3 inches high.
   - 1 Cube, 12 inches edge.
   - 1 Monolith (forming the body of the obelisk), 3 feet high.
   - 1 Pyramid, 6 inches base.

   The complete object is thus nearly 5 feet high.

Models, Vases, Diagrams, &c., entered as sets, cannot be supplied singly.

2. A Market Cross, composed of—
   3 slabs, 24, 18, and 12 inches across, and each 3 inches high.
   1 Upright, 3 feet high.
   2 Cross Arms, united by mortise and tenon joints.
   Complete height, 3 feet 9 inches.
3. A Step-Ladder, 23 inches high.
4. A Kitchen Table, 14½ inches high.
5. A Chair to correspond.
6. A Four-legged Stool, with projecting top and cross-rails, height 14 inches.
7. A Tub, with handles and projecting hoops, and the divisions between the staves plainly marked.
8. A strong Trestle, 18 inches high.
9. A Hollow Cylinder, 9 inches in diameter, and 12 inches long, divided lengthwise.
10. A Hollow Sphere, 9 inches in diameter, divided into semi-spheres, one of which is again divided into quarters; the semi-sphere, when placed on the cylinder, gives the form and principles of shading a Dome, whilst one of the quarters placed on half the cylinder forms a Niche, as in the illustration.

Price for the set complete, packed in box, £9.

MODELS OF BUILDING CONSTRUCTION.

I. DETAILS OF A KING-POST TRUSS, £2.

II. „ „ SIX-INCH TRUSSED PARTITION FOR FLOOR, £3 3s.

III. „ „ TRUSSED TIMBER BEAM FOR A TRAVELLER, £4 10s.

CUSSONS' LARGE VASES IN WOOD FOR MODEL DRAWING.

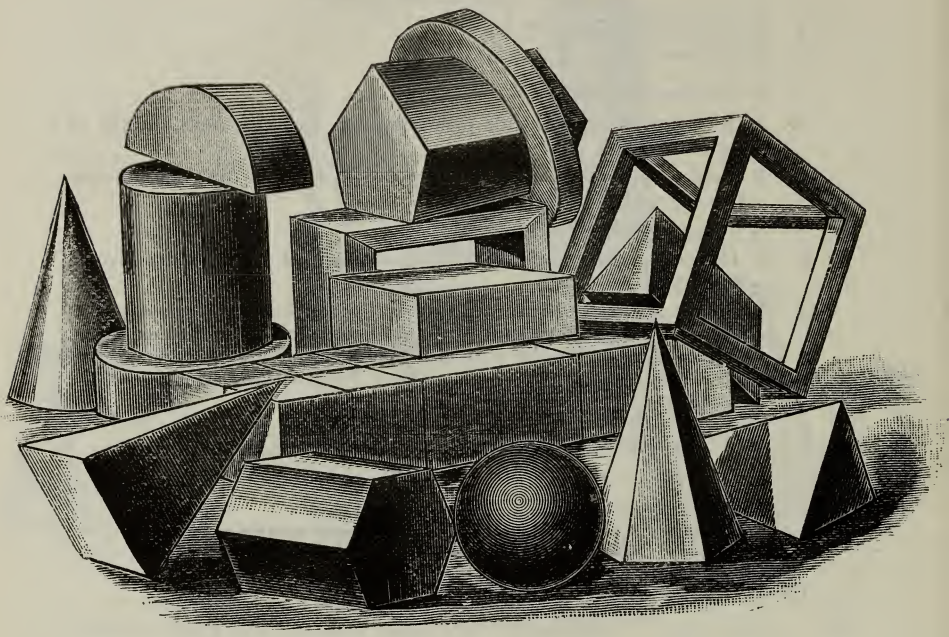
The average height of these models is about 24 inches; they are well suited for large art classes and examinations. The vases are very strong and light, being built up in parts with the best material, and perfectly accurate in shape.

Celadon Jar	£1 0 0
Indian Jar	2 0 0
Bottle	2 0 0
Small Vase in Terra-Cotta Set	1 10 6

* Models, Vases, Diagrams, &c., entered as sets, cannot be supplied singly.

MARLE'S NEW SCHEDULE DRAWING MODELS.

By H. MARLE and J. HIGGISON.



The Set consists of 21 substantially made Models, specially designed to meet the recent Government Requirements in Elementary Schools, Colleges, Art Classes, &c., for teaching Model Drawing as a Class Subject. Special attention has been given to the following points, viz., accuracy of form, suitability of size, variety, durability, and economy.

The Models are :—

Triangular Pyramid	.. ..	8 inch diameter,	12 inch axis.
Square Pyramid ..	.. ..	8 ,,	12 ,,
Hexagonal Pyramid	.. ..	8 ,,	12 ,,
Cone Pyramid ..	.. ..	8 ,,	12 ,,
Triangular Prism ..	.. ..	8 ,,	12 ,,
Pentagonal Prism	.. ..	8 ,,	12 ,,
Hexagonal Prism	.. ..	8 ,,	12 ,,
Cylinder	.. ..	8 ,,	12 ,,
Short Cylinder ..	.. ..	12 ,,	4 inches thick.
Semi-Cylinder ..	.. ..	12 ,,	4 ,,
3 Square Prisms ..	.. ..	12 inches long,	6 inches square.
3 Cubes	.. ..	.. .. ..	6 inches edge.
1 Cube	.. ..	.. .. ..	10 ,,
Skeleton Cube ..	.. ..	12 inches edge,	$1\frac{1}{2}$ inch section.
Ring	.. ..	12 inch diameter,	$1\frac{1}{2}$ inch sq. section.
Hollow Square Prisms	.. ..	14 in. long, $4\frac{1}{2}$ in. deep,	$1\frac{1}{2}$ in. thick.
Sphere	.. ..	.. .. ..	8 inches diameter.

Price for the complete Set, packed in strong case, £4 5s.

* ELLIS A. DAVIDSON'S APPARATUS FOR TEACHING PRACTICAL GEOMETRY.

The set consists, in the first place, of the various plane geometrical figures, made of wood and of large dimensions, the size of the polygons being such as would be contained in circles of 16 inches diameter.

The figures are arranged for hanging round the room; they are painted white: the name of each, the number of angles, and other brief definitions, being plainly inscribed on it.

By means of that education of the eye which is so important in schools, the pupils become accustomed to the forms, their names and peculiarities; and much time, otherwise spent in teaching mere definitions, is thus saved; whilst the observant faculties are strengthened by the opportunities afforded of comparing these accurate forms with each other.

The second portion of the set consists of objects for illustrating the properties of various figures which have been hitherto taught in theory only.

The third division includes apparatus for the practical construction of several important curves.

The following is a list of the Apparatus:—

Section 1.—A Square; an Oblong; an Equilateral Triangle; a Scalene Triangle; an Isosceles Triangle; a Rhombus; a Rhomboid; a Trapezium; a Trapezoid; a Pentagon; a Hexagon; a Heptagon; an Octagon; a Nonagon; a Decagon; a Dissected Circle, illustrating the terms applied to the different lines and parts in it.

Section 2.—Model, showing the different sections of a Cone; Apparatus illustrating the method of converting a Triangle into a Rectangle of equal area; Apparatus illustrating the method of constructing, on the Hypothenuse of a Right-angled Triangle, a Square equal in area to the squares described on the sides which contain the right angle. (Euclid, book i., prop. xlvii.)

Section 3.—Apparatus for practically describing the Cycloid, Epicycloid, Hypocycloid, and Involute.

Price for the set complete, packed in box, £5.

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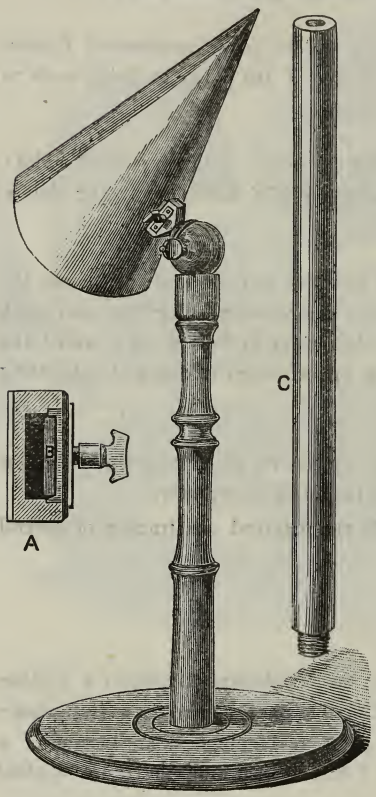
* Models, Vases, Diagrams, &c., entered as sets, cannot be supplied singly.

WISE'S ADJUSTABLE STAND.



This Stand has a guard plate, B, which so moves forward as to prevent the set screw from damaging the holder.

The construction of the joint is such as to render movement impossible when set by the screw.

It has a second action, so that when the model is set at the desired angle it can be moved to the required latitude.

It has, moreover, an extra arm, C, admitting of the Stand being placed on a table or on the floor.

Price, complete, with extra arm, £1 6s. (packing, 2s.). Ditto, without extra arm, £1 (packing, 2s.).

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* BINN'S MODELS

For illustrating the elementary principles of orthographic projection as applied to mechanical drawing, containing House Hip Roof, Cube, Dissected Cube, Sunk Base, Straight-edge, Open Mould, Pair Steps. In box, £1 10s.

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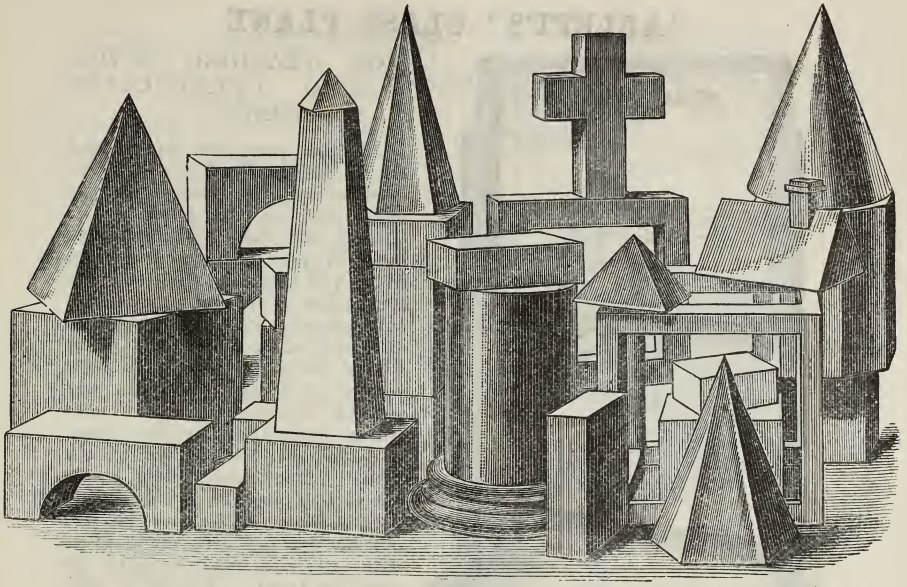
* Models, Vases, Diagrams, &c., entered as sets, cannot be supplied singly.



J. M. DICKSEE'S CONSTRUCTIVE SOLID DRAWING MODELS,

Consists of 34 Pieces. In Box, £8.

2 Oblong Cubes, 6-in. by 6-in. by 12-in., with a Semicircle Arch formed in same.

1 12-in. Cube. 1 12-in. by 15-in. Square Pyramid.

1 Skeleton Cube, 14-in. side. 1 Frame, 14-in. square.

1 Hexagonal Prism, 9-in. by 12-in. 1 Hexagonal Cone, 9-in. by 12-in.

1 Cylinder, 9-in. by 12-in. 1 Base Moulding, 12-in. diameter by 3-in.

1 Cone, 9-in. by 12-in. 1 Octagon Pyramid, 6-in. by 12-in.

1 Oblique, 3-in. by 5-in. by 18-in., and Pyramidal Block for top of same.

2 6-in. Cubes. 1 6-in. Pyramid.

2 9-in. by 6-in. by 6-in. Cubes.

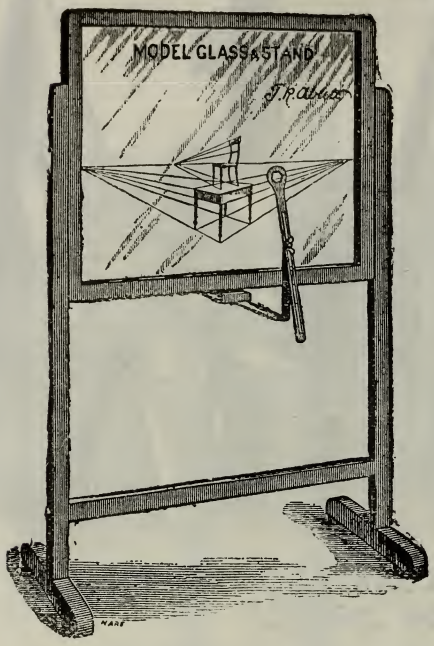
1 6-in. by 9-in. Triangular Prism; when placed on Cube forms a house, and there is 1 Chimney shaped block and 1 Dormer Window to surmount roof.

2 6-in. by 6-in. by 3-in. Slabs. 2 3-in. by 6-in. by 9-in. Slabs.

2 9-in. by 3-in. by 3-in. Blocks. 2 6-in. by 3-in. by 3-in. Blocks.

2 3-in. Cubes. 1 Cross, 12-in. by 9-in.

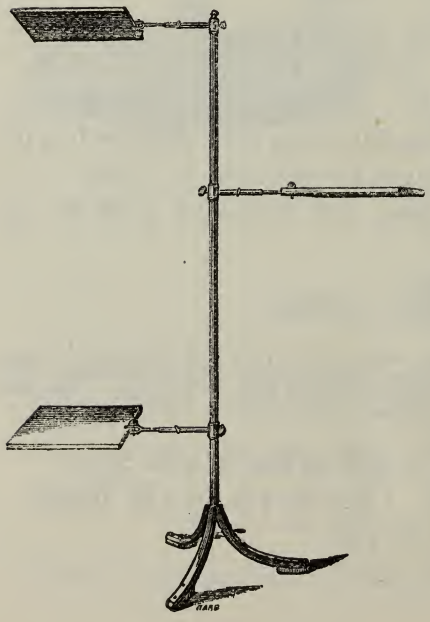
"ABLETT'S" GLASS PLANE



(FOR TEACHING MODEL AND PERSPECTIVE DRAWING).

All the principles of Second Grade Model Drawing and Perspective can be experimentally demonstrated on the Glass. The teacher, with the position of his eye fixed by the movable iron ring, traces with brush and Chinese white the outline of the object (rod, disc, cube, or chair, &c.), which is placed on a table or the floor on the farther side of the Glass. The pupils, one by one, look through the ring and see for themselves that the lines traced on the Glass by the teacher coincide with the outline of the model. The teacher then points out in what way the representation on the Glass differs from the real object, and produces the outlines with ruler and brush to show the vanishing points. The pupils must afterwards make a drawing on paper from the real object, each one from a different position in the room.

Large Size, 39 in. by 30 in.	£1	16	0
Medium Size, 30 in. by 24 in.	1	13	0
Small Size, on Central Pillar Stand, 24 in. by 18 in.	0	18	0

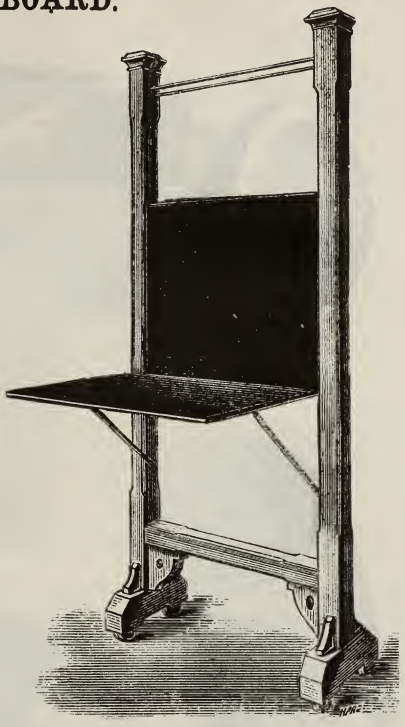


"ABLETT'S" OBJECT STAND

(FOR SHOWING SIMULTANEOUSLY SIMILAR OBJECTS IN DIFFERENT POSITIONS).

The Object Stand is for beginners, and is used in conjunction with the Glass Plane. Three simple objects, for example — three squares in wood of the same size and shape are placed one above, one on a level with, and one below the eye. The position of the eye is fixed by the ring of the Glass Plane. The difference between *appearance* and *reality* is forcibly shown by the tracings (each of which is different, though drawn from similar objects), made by the teacher on the Glass, and which each pupil looks at through the ring. £1 1s.

THE "DARLINGTON" SOLID GEOMETRY SLATEBOARD.



Consisting of a "Darlington Special B Slateboard," divided in the centre, so that the lower portion can be adjusted in a horizontal position to the vertical upper half, and so that the solid can be placed in the angle formed by the Horizontal and Vertical Planes. With the aid of a large set-square the points, where the projectors meet the two planes, can be marked, and the plan and elevation drawn. When the drawing is completed the Horizontal and Vertical Planes are adjusted so as to form one surface or plane. The crack between the upper and lower portion of the board represents the intersecting line. £3 15s.

Ditto, *without Stand* (as supplied to the London School Board), 16s.

WIRE SKELETON MODELS FOR ILLUSTRATION.

WIRE MODEL showing how to find the true length, inclination, and traces of a line, 3s. nett.

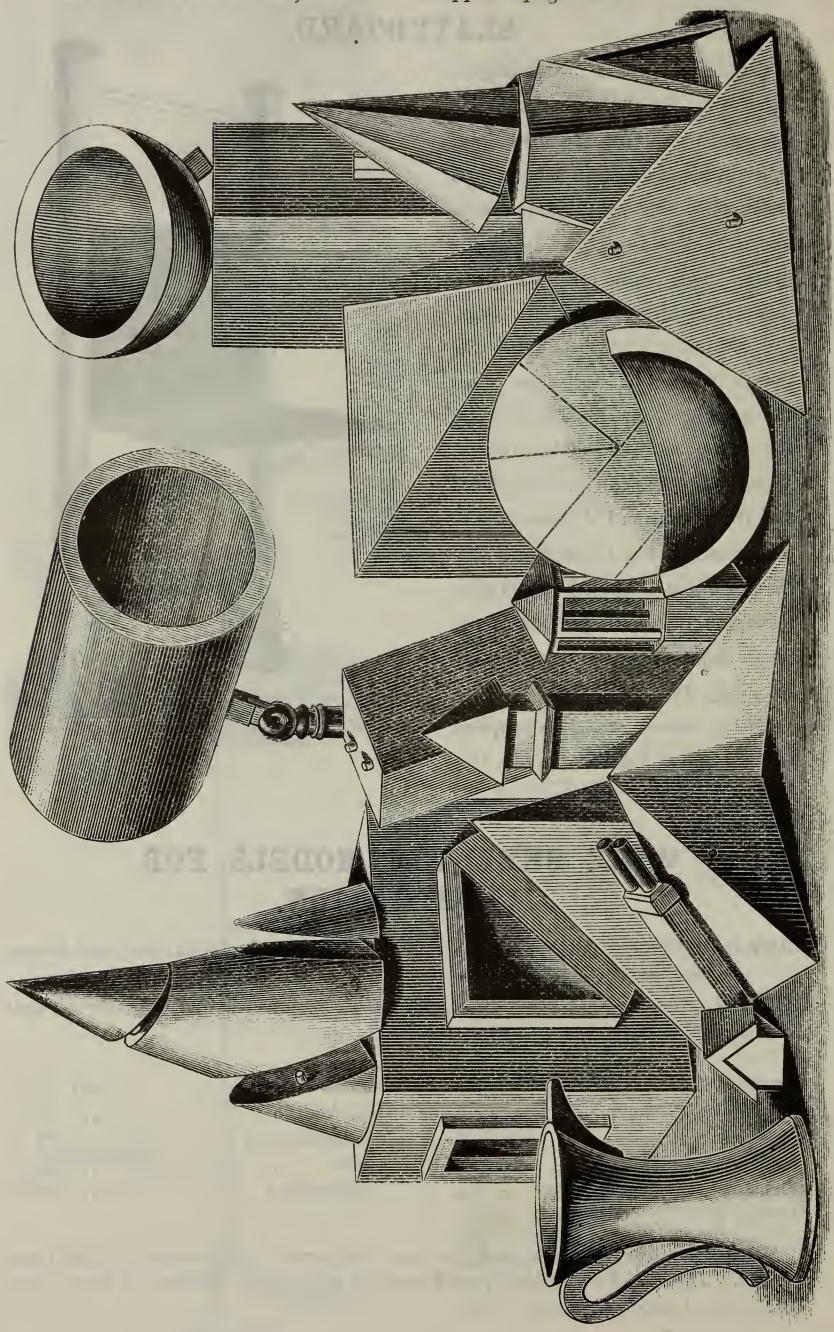
MODEL showing that every triangular prism may be divided into three equal triangular pyramids, 4s. nett.

		s.	d.			s.	d.
Square Prism	nett	4	0	Tetrahedron	nett	4	0
Triangular Prism ..	,,	4	0	Octahedron	,,	8	0
Hexagonal Prism ..	,,	6	0	Dodecahedron	,,	8	0
Square Pyramid	,,	4	0	Cube	,,	4	0
Cone	,,	4	0	Icosahedron	,,	8	0
Cylinder	,,	4	0				

These are strongly made, and the axes, diagonals, or diameters of the faces shown. They are 8 *inches high, with bases in proportion, and will be found very useful for lecture purposes.*

WISE'S TRANSMUTATION MODELS.

For full details see opposite page.

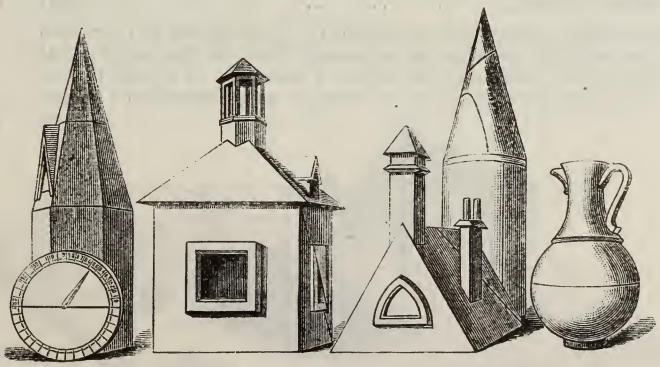


WISE'S TRANSMUTATION MODELS.

These Models are made in Sections, by which different forms are produced, either by parts of one model, or by the parts of the different Models in combination.

Set of 8 models containing 32 pieces, in box complete, £10; or in parts as detailed below.

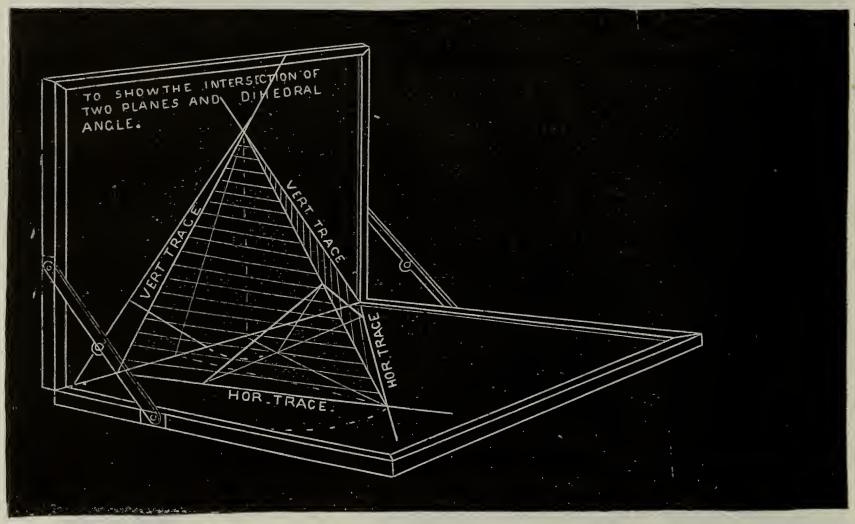
1. CYLINDER, 24 inches long by 15 inches diameter. TWO DISCS, 15 inches diameter, to form ends to Cylinder, so that it appears to be solid. On these Discs are lines with the Geometric names belonging to them, such as "Circumference," "Diameter," "Radius," &c. £1 6s.
2. GLOBE, 15 inches diameter. One-half of Globe forms a Dome, when placed on top of Cylinder (No. 1). One-fourth of Dome placed on one-half of Cylinder (No. 1), forms a Niche. The Globe has four additional Sections, which, when added, will form it into a Vase or ornamental Jug 31 inches high. £1 15s.
3. DISSECTING CONE, 24 inches by 15 inches, in four pieces. One-half of Globe (No. 2) can be added to form globular base to Cone. £1 6s.
4. HEXAGONAL PRISM, 20 inches by 14 inches, in three sections. The central Section forms an Oblong Cube; the two smaller external Sections, when combined, form a Rhomboidal Prism. £1 9s.
5. HEXAGONAL CONE, 24 inches by 14 inches diameter. This Cone can be placed on the Prism (No. 4), and the whole forms a Steeple with Spire. There are two small Sections which can be added to the Cone, which form Angular Pediments, and are intended to suggest details when it is being sketched as a steeple. £1 6s.
6. CUBE, 20 inches, dissected diagonally in two, pierced in four sides, with projecting fillets. £1 12s.
7. PYRAMID, 22 inches by 14½ inches, dissected in two. This Pyramid, when placed on top of Cube (No. 6), makes a roof, and the two thus combined form a house, to which there is a lantern light for the apex of Roof. To this the apex of a Hexagonal Cone (No. 5) can be added to form a small Spire and a Dormer Window. £1.
8. A TRIANGULAR PRISM, 20 inches by 20 inches. Dissected in two pieces. This Prism forms two different Roofs when added to the Cube (No. 6) according as it is placed, either whole or by means of one of its pieces. When whole, it gives two gables; when one piece only is used it produces one gable, and a roof with three sloping sides. For this Roof there is a surmounting Turret, and also a Chimney, as well as a fillet-formed window for the Gable. £1.



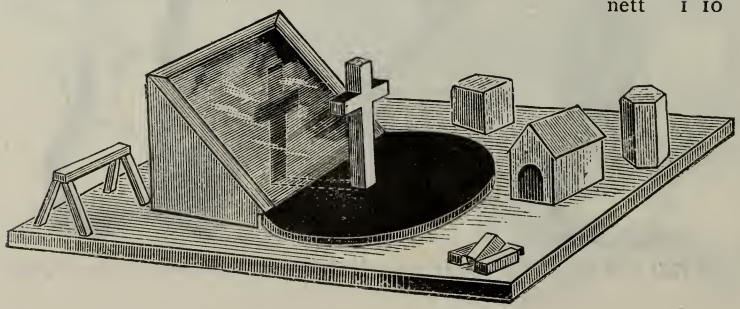
A full and detailed Block of these Models will be found on opposite page.

PROFESSOR REYNOLDS, F.R.S., and CUSSON'S MODELS for teaching Descriptive and Solid Geometry. The Models consist of Folding Planes and Coloured Strings. The solutions are fully shown by Coloured Drawings, mounted and varnished. The Models are well made, portable, and durable, will fold up neatly, and are always ready for use.

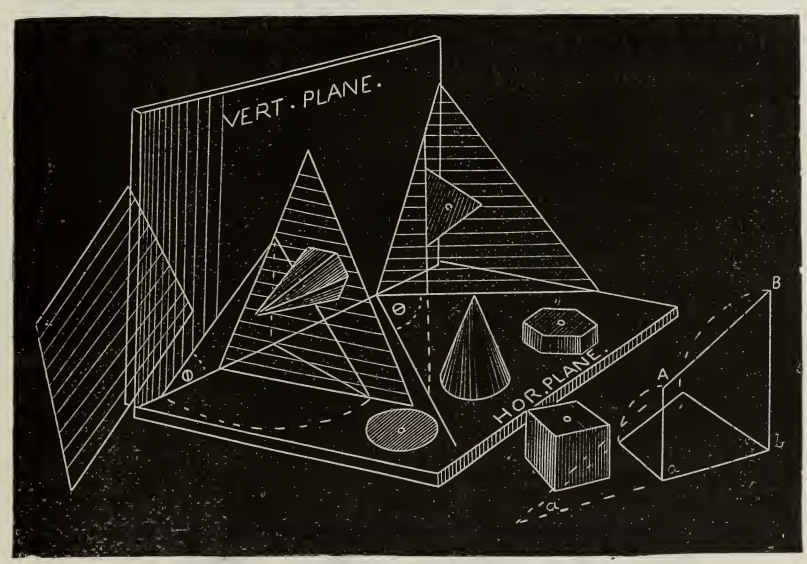
	£	s.	d.
Shows straight lines—their projections, traces, intersections, inclinations, methods of finding true length, angle between two lines, nett	1	10	0
Shows a plane, its traces, the relation between the traces of a plane and the traces of lines lying in it, also between the traces of a plane and the projections of a normal Horizontal line in a plane, Intersection of a line and plane .. .. nett	1	10	0
Shows two intersecting planes, their traces, intersection, also method of determining the dihedral angle .. .. nett	1	10	0



	£	s.	d.
Shows a pair of cones enveloping a sphere, and a plane tangential to them, method of drawing a plane at given inclinations to the co-ordinate planes.. .. .. nett	1	10	0
Apparatus with inclined and rotating mirror, showing plan and elevation of an object in one view, also showing elevation upon any vertical plane, thus illustrating the effect of alteration of ground line.—A number of useful objects of form are supplied with the model, nett	1	10	0



	£	s.	d.
Blackboard, folding plane, capable of assuming either a flat or right-angled position, with which are supplied movable wire planes and objects of form to illustrate rabbetment, the real angle between the traces of planes, placing a line in a given plane, showing special problems, &c. The principal lines are painted on the model .. .. nett	1	0	0
Large Blackboard folding plane, 44 in. by 30 in., for teaching solid geometry and projection. This model may be fixed against a wall or on an easel. Wire planes and accessories are supplied for demonstration, and the surface of the board prepared for chalk lines. It may also be used as an ordinary Blackboard without easel	1	5	0
with easel	2	15	0



Cabinet with shelving partitions, to hold the five foregoing models, is well made of pitch pine and varnished .. .. .. nett	1	10	0
Smaller Blackboard Model, 12 in. by 9 in., as above, with prepared surface for chalk lines, movable planes, and objects of form, with a third plane to show change of ground line .. .. nett	0	10	0
Twelve sheets of Developments of Solids, in cardboard, with coloured background, 12/6 nett; bound .. .. nett	0	17	6
Four diagrams of Problems, in Descriptive Geometry, lines variously coloured, mounted on cloth and rollers, varnished.. each, nett	0	4	6

PENETRATION MODELS (SOLID).

CONE AND SPHERE, 10s. nett.

CYLINDER AND CONE, 10s. nett.

TWO CYLINDERS, axes at right angles, 10s. nett.

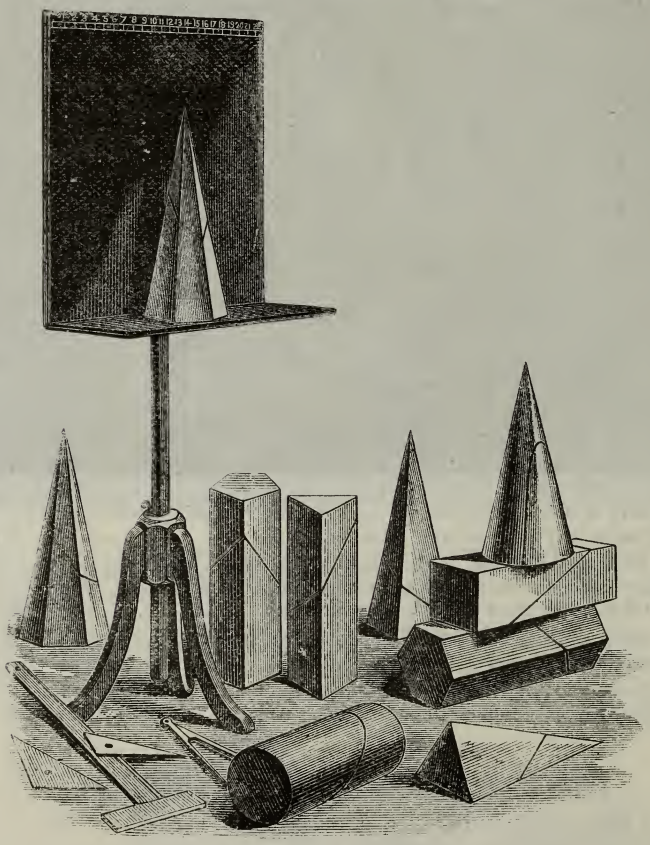
TWO CYLINDERS, axes oblique, 10s. nett.

For art teaching, as well as projection, these will be found useful. They are about 6 *inches diameter, and* 10 *inches high.*

MILLER'S SECTIONAL MODELS, FOR THE EASIER TEACHING OF SOLID GEOMETRY,

Have been designed principally for the higher classes of National Schools and the New Code, but will be equally useful in Schools of Art and Night Classes.

The Set consists of a blackboard with upper and lower planes, ten Sectional Models, namely, four Prisms, four Pyramids, one Cone, and one Cylinder. The Models are piece built to give strength, and prevent warping. The sectional faces are slightly coloured to give greater distinctness to the sectional contour. The compasses are fitted with a shoe and wedge, which gives no trouble in fitting and fixing the chalk. T and Set Squares complete the set. The Models are large enough to be used in groups with other objects. Complete in Box, £7 10s.



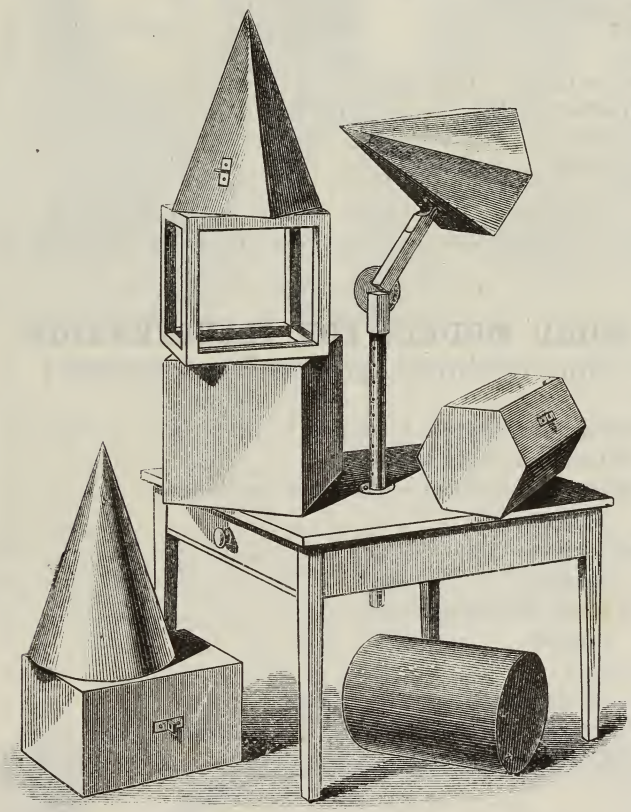
GEOMETRICAL POLYGONS, 7 in. in height, and ¾ in. thick.

Triangle, Square, Pentagon, Hexagon, Heptagon, Octagon, with printed labels upon each figure .. .. nett, 10s.

These Models are suitable for hanging upon the wall of a School or Class Room, or for Model Drawing.

MILLER'S NATIONAL SCHOOL MODELS

Have been specially designed for National School classes. Eight Models—Skeleton Cube, Solid Cube, Cone, Cylinder, Square Prism, Square Pyramid, Hexagonal Prism, and Hexagonal Pyramid. A table, 2 feet 3 inches high, the top being 2 feet 6 inches by 2 feet, with a revolving staff with discs for securing a model in any position, so that two or more of the others may be grouped at the base. The sizes of the models have been determined from experimental lessons. £5 15s. (Packing case, 10s.)



NEW MODELS IN RELIEF. 12 Cards in each Set.

SET A.—Ornaments. 5s.
SET B.—Ornaments, 5s.
SET C.—Ornaments and Heads. 6s.
SET D.—Heads. 6s.

MILLER'S CLASS DRAWING MODELS.

These Models are the largest published, and are particularly adapted for teaching large classes.

The stand is very strong, and the universal joint will hold the Models in any position.

	WOOD MODELS.			WIRE MODELS.		
1.—Triangular Prism	.. ..			17 in. side	22 in. high	12s.
2.—Square ,, ..	12 in. side	18 in. high	11s.	14 ,,	20 ,,	12s.
3.—Hexagonal ,, ..	14 ,,	18 ,,	11s.	16 in. diam.	21 ,,	12s.
4.—Cube	14 ,,		11s.			
5.—Cylinder	13 in. diam.	16 ,,	12s.	14 ,,	21 ,,	12s.
6.—Hexagon Pyramid		22½ ,,	11s.	18 ,,	24 ,,	12s.
7.—Square ,,	14 ,,	22½ ,,	11s.	17 in. side	24 ,,	12s.
8.—Cone	13 ,,	22½ ,,	12s.	17 ,,	24 ,,	12s.
9.—Skeleton Cube ..	19 in. side		13s.	19 ,,		12s.
10.—Intersecting Circles		19 in. diam.	15s.	19 ,,		12s.
11.—Plain Circle				19 ,,		10s.
12.—Plain Square				19 ,,		10s.
13.—Sphere			21s.			

Table, 27 in. by 21½ in., 8s. Stand, £2 10s.

The Set complete, with Table and Stand, £15 14s. (packing cases, 30s.).

SOLID MODELS FOR ILLUSTRATION.

(FOR TEACHING GEOMETRICAL DRAWING.)

		£	s.	d.
Cone, with three sections, base 5 inches	nett	0	5	0
Frustum of Cone, base 5 inches	,,	0	3	6
Hexagonal Prism, with oblique sections, 6 inches diameter ..	,,	0	5	0
,, Pyramid ,, ,, ,, ..	,,	0	5	0
Pentagonal Prism ,, ,, ,, ..	,,	0	5	0
,, Pyramid ,, ,, ,, ..	,,	0	5	0
Triangular Prism, with oblique section ,, ..	,,	0	4	6
,, Pyramid ,, ,, ,, ..	,,	0	4	6
Square Pyramid ,, ,, ,, ..	,,	0	4	6
Cylinder, with oblique sections, 5 in. diameter	,,	0	4	9
Square Prism, with sections, to illustrate a fundamental proposition in handrailing	,,	0	3	6
Tetrahedron	,,	0	2	6
Cube	,,	0	3	0
Octahedron	,,	0	3	6
Dodecahedron	,,	0	5	0
Icosahedron	,,	0	5	6
Sphere (built) 8½ in. diam...	,,	0	6	0

The five foregoing regular bodies are of such a size as may be enveloped by a sphere 8½ inches diam. The six models thus form a comparative set.

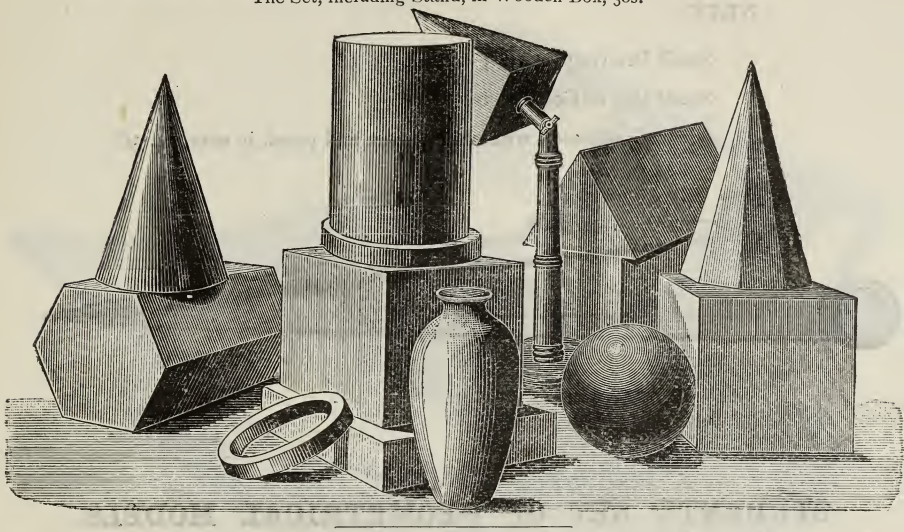
The models are painted white, with sectional surfaces red.

G. CUSSON'S INTERMEDIATE DRAWING MODELS.

Contains the following Twelve well-finished Models, painted White; average height, 8 inches:—

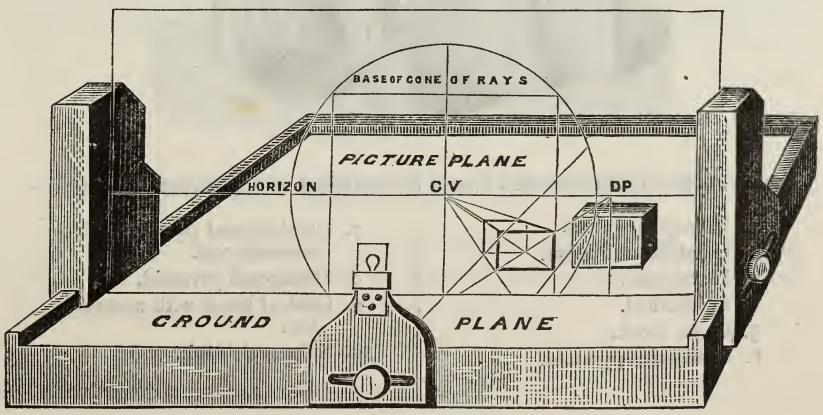
Cube, 6″	Triangular Prism	Cone	Vase of Hardwood
Sphere	Square Pyramid	Ring	Pitch-pine, polished,
Hexagonal Prism	Octagon Pyramid	Cylinder	adjustable Stand
Square Prism	Square Plinth		

The Set, including Stand, in Wooden Box, 30s.



P. JOLIN'S PATENT PERSPECTIVE MODEL.

Consists of a rectangular base board for holding a movable plan representing the ground plane, and having the position of the object and the direction of the vanishing lines shown; there is, also, a piece representing the spectator, and uprights to hold the glass slide, which is the picture plane itself, having on it all the lines usually drawn on the paper; the vanishing lines, measuring lines, and representation of the object being in different colours, so as to be easily distinguishable; the glass slide is also drilled, so that threads can be passed from the different points of the object to the spectator. A rectangular block accompanied by two sets of ground plans and glass slides, one set for parallel and the other for angular perspective, as well as a slab having a circle drawn thereon, and a suitable ground plan and glass slide, are supplied with each model. In box, £4.

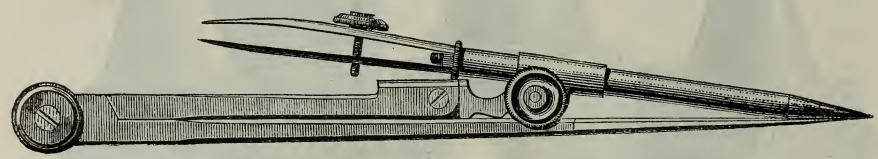


THE THREE FOLLOWING ARE SUPPLIED AS PRIZES TO FIRST GRADE STUDENTS IN ELEMENTARY SCHOOLS, AND MAY BE HAD AT THE PRICES QUOTED, WHICH ARE NETT.

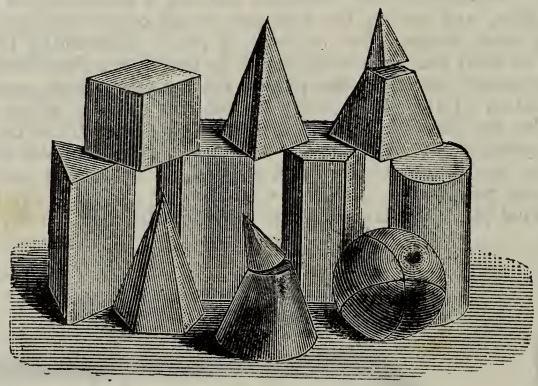
Small Drawing Board T-square, 2s. 3d.

Small Box of Colours, 2s. 3d.

6-inch Compasses, with shifting pen and point, in case, 2s. 3d.



STUDENTS' SET OF GEOMETRICAL MODELS.



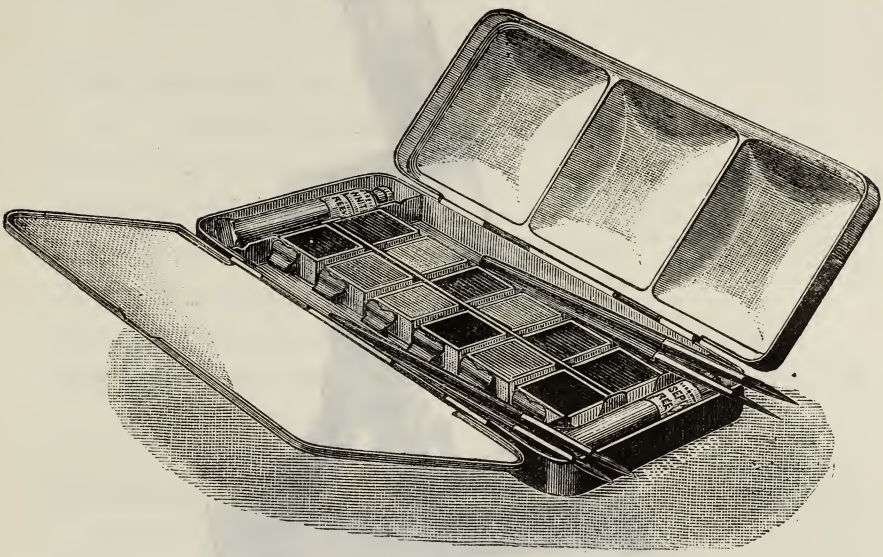
The set consists of 10 pearwood figures in dovetailed sliding-lid box, 10s., viz:—

1. Triangular prism.
2. Quadrilateral prism.
3. Hexagonal.
4. Cylindrical.
5. Cubic block.
6. Triangular pyramid.
7. Quadrilateral pyramid with movable top.
8. Hexagonal pyramid.
9. Conical block with movable top.
10. Spherical block.

"THE PUBLIC SCHOOLS" COLOUR BOX.

For Schools, Art Classes, Designers, &c.

Price 5*s.*



Containing Twelve Colours in china pans :—Burnt Sienna, Green Bice, Raw Sienna, Yellow Ochre, Cobalt, Brown Madder, Crimson Lake, Gamboge, Vermillion, Vandyke Brown, Light Red, Indigo, Tubes of Sepia and Chinese White, and Four Brushes.

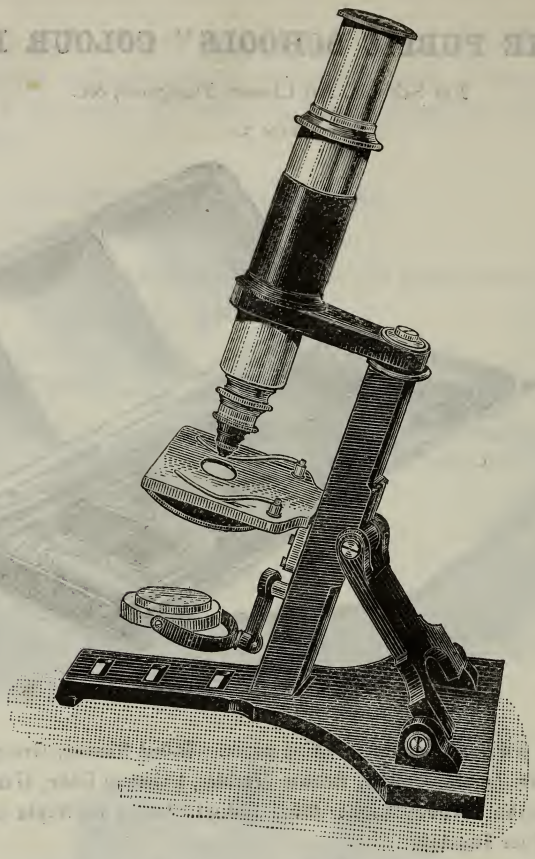
The box is of japanned tin, and in appearance is equal to the best boxes.

The colours, which are secured in their places by patent spring clips, are mostly the true artists' pigments, presented in a much less expensive form, and will be found to be equally good for educational purposes and for all ordinary work.

"THE PUBLIC SCHOOLS" DRAWING SETS.

Comprising a Drawing Board, made of well-seasoned deal, with hard wood battens, T-Square, and 45° and 60° Set Squares, fitting together in a compact set for convenience in carrying. Made in two sizes, viz. :—

Half Imperial, 22-in. by 15-in.	3s. 6d.
Quarto Imperial, 15-in. by 11-in.	2s. 0d.



THE "PRIZE" MICROSCOPE.

This Instrument combines steadiness, portability, and optical excellence, at a very moderate price. The compound body, which slides smoothly in a cloth-lined collar, may be used erect, or inclined at various angles, and is kept in position by a jointed steadying arm. The Stand is furnished with stage having spring clips, revolving diaphragm with various sized apertures, concave mirror on swing arm, Huyghenian B eyepiece, and a superior 1½-inch and ⅓-inch achromatic combination (separable).

Magnifying powers, namely, 1½-inch, 55 diameters; ⅓-inch, 110 diameters.

Packed in neat Mahogany Case, 10-inch by 5-inch by 4-inch.

Price 42*s. nett.*

INSTRUMENTS, COLOURS, DRAWING-BOARDS, &c.

BOXES OF WATER COLOURS, 8s. and 12s. nett.

,, ,, MOIST COLOURS, in case, 20s. nett.

SMALL BOX OF COLOURS, 2s. 3d. nett.

BOXES OF CRAYONS, 8s., 12s., and 20s. nett.

CASE OF SPRING BOW COMPASSES, 10s. nett.

CASES OF INSTRUMENTS, 8s., 12s., and 20s. nett.

6-INCH COMPASSES, with shifting pen and point, in case, 2s. 3d. nett.

DRAWING-BOARD AND T-SQUARE, 8s. nett.

,, ,, ,, ,, & SET SQUARES, 12s. nett.

,, ,, (Engineer's) ,, ,, ,, & ANGLES, 20s. nett.

DRAWING-BOARD 17 inches by 10½ inches, with T-Square, 2s. 3d. each, nett; if in large quantities, 2s. nett.

RELIANCE COMPASS AND UNIVERSAL HOLDER, for use on blackboard, 4s.

LARGE COMPASSES, with chalk-holder, 5s.

*SLIP, TWO SET SQUARES AND T-SQUARE, 5s.

MAHOGANY HOOK CASE, containing 6-inch brass compass with pen and pencil points, and 6-inch boxwood plotting scale, 4s. nett.

MAHOGANY HOOK CASE, containing 6-inch brass compass with pen and pencil points, drawing pen, and boxwood plotting scale, 5s. nett.

MAHOGANY HOOK CASE, containing 6-inch brass compass with pen and pencil points, brass divider, drawing pen, and boxwood plotting scale, 6s. nett.

SMALL SIZE RELIANCE COMPASS, with pencil leg, 6d.

T-SQUARE AND TWO SET SQUARES, 45°, 60°, 6d. nett.

IMPERIAL DEAL FRAMES, without sunk rings, 10s. each.

SMITH'S SCHOOL SQUARES, in cardboard, 1s. 6d. each.

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* Models, Vases, Diagrams, &c., entered as sets, cannot be supplied singly.

MARLE'S NEW RULERS AND PATENT DIVIDED SET SQUARES.

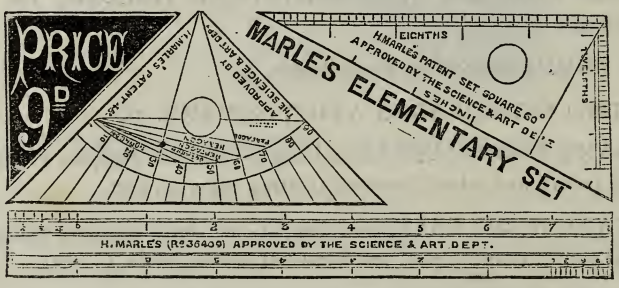
SPECIALLY DESIGNED TO MEET THE GOVERNMENT REQUIREMENTS FOR ELEMENTARY AND ADVANCED DRAWING TO SCALE.

ELEMENTARY SET. Complete, 9d.

CONSISTING OF (REG.) 9-INCH FLAT RULER AND PATENT 45° AND 60° SET SQUARES.

This Flat Ruler contains four scales—two on each side—and is double bevelled on front face, so that a keen edge may always be placed close to the paper when ruling a line or marking off distances. The Scales used are the most useful for Elementary Drawing, viz. *Eighths*, *Twelfths*, *Tenths*, and *Quarters* of Inches respectively, the last mentioned also showing 3 Inches to 1 Foot. The divisions are *engine-divided* (thus ensuring accuracy) and marked and figured as required by the Science and Art Department.

The 45° and 60° Set Squares are variously marked on the edges with *Inches*, *Half-Inches*, *Quarters*, *Eighths*, and *Twelfths*, as also on one side of the 45° Set Square with an Elementary Protractor of 90°, which illustrates clearly the measurements of Angles by Arcs of Circles and the construction of the Scale of Chords. These Set Squares afford unlimited scope for right-lined exercises, *i.e.* drawing parallel lines at fixed distances, angles of any number of degrees—Square, Oblong, Pentagon, Hexagon, &c., &c., without the aid of compasses, thus enabling the scholar to draw with accuracy the copies he is afterwards to imitate in Freehand, and providing the best possible introduction to Geometrical and Mechanical Drawing.



BLACKBOARD SET. 7s. 6d.

CONSISTING OF 3-FEET FLAT (REG.) BLACKBOARD RULER AND EXTRA LARGE PATENT 45° AND 60° SET SQUARES.

The Blackboard Ruler is made of the finest seasoned Boxwood, painted with black lines over the divisions, figures, &c., and the Scales used are the same as marked on 9-inch Flat Ruler in Elementary Set, *i.e. Eighths* and *Twelfths*, but enlarged to ½ foot from 1-inch Scale. The marking can be clearly seen at a long distance from Blackboard, and a Brass Handle is firmly screwed on Ruler to ensure a steady grip of Ruler in one hand whilst drawing a long chalk line.

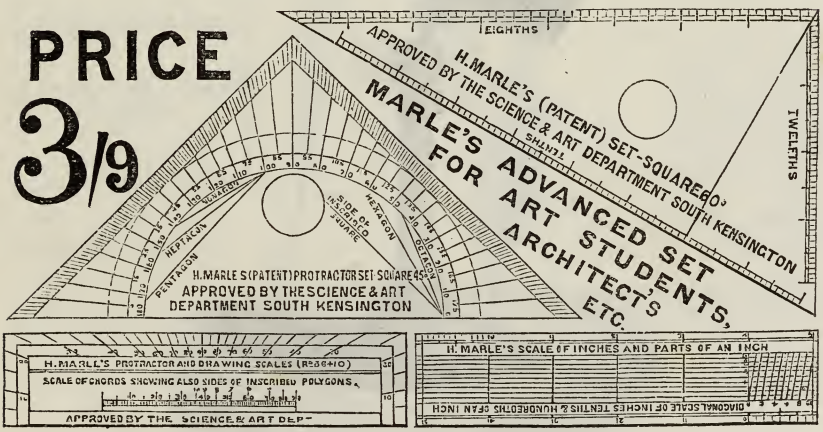
The extra large size Set Squares are also plainly painted in black in imitation on a larger scale of the small size Set Squares used in Elementary Set. They may be clearly seen at a long distance from Blackboard.

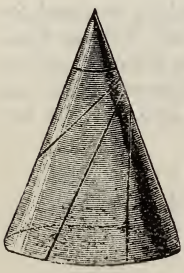
ADVANCED SET. Complete, 3s. 9d.

CONSISTING OF SIMPLIFIED (REG.) PROTRACTOR AND PATENT 45° AND 60° LARGE SET SQUARES.

This Protractor is simplified, both as to its divisions and figuring, to meet the requirements of beginners in *Solid Geometry*. It has also the Scale of Chords, with sides of Inscribed Polygons marked on it. On the opposite face there are the following *accurate* and properly-figured 6-inch Scales, with a margin at each end, *viz.* at the edges:—(1) *Scale of Inches and Eighths;* (2) *Scale of Inches and Twelfths;* and in the middle of the face (3) *A Diagonal Scale*, showing Inches and Decimals of an Inch, *i.e.* Tenths and Hundredths.

The larger (45° and 60°) Set Squares required for Solid Geometry and other purposes have the edges variously divided in *Inches*, *Eighths*, *Twelfths*, *Tenths*, &c., and one side of the 45° Set Square shows clearly the complete Semi-Circular Protractor of 180° with improved figuring; the relation between Angles and the Circles are more clearly shown, and also the sides of Inscribed Polygons, thus meeting all requirements for ordinary Geometrical Drawing.





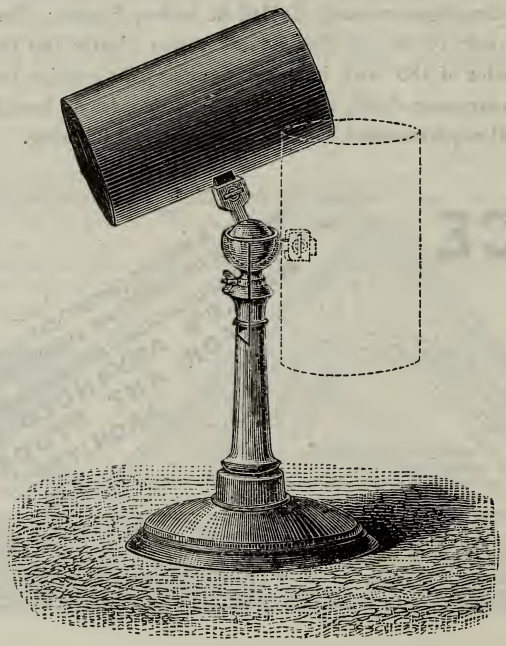
LARGE CONE, 15 inches high, 9 inches at base, with 4 sections, as per illustration, packed in box complete, 20s.

TABLE STAND TO SHOW MODELS.

This stand is, in its main parts, made of cast-iron, and its construction allows the centre of gravity to rest on the pedestal, thus displaying its stability to the greatest advantage.

Full attention has been paid towards facilitating the fastening of the models to the stand. By means of its ball-joints, the models may be put into any position for drawing. The hinges, consisting of two wooden sockets in which the ball moves in any direction, allow of the above-mentioned movements, and by the use of the screw the model can be fixed in any position.

This stand is painted in a dull black colour, in order to give due prominence to the model, which will be of a light shade. £1 5s. (Packing case, 2s.)



LOCKIE'S IMPROVED DRAWING SCALES. Specially designed for Engineers, Architects, and Students of Machine and Building Construction Classes, adapted to the requirements of the Science and Art Department. These Scales are finely engraved, and printed on the best Cardboard, varnished, and enclosed in a neat cloth case. 1s. per set, 9s. per dozen, nett.

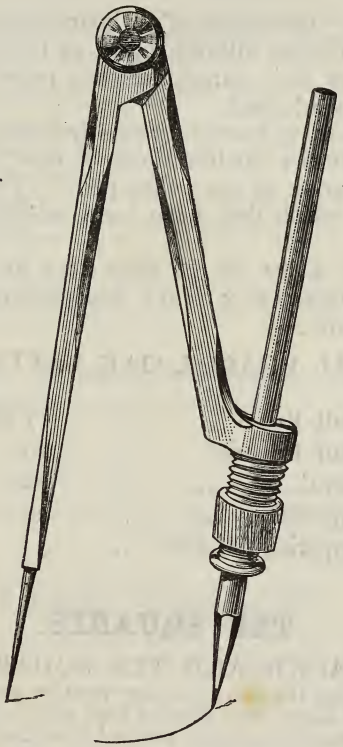
No. 1 ..... 12-in. & 6-in.	No. 5 ..... $\frac{3}{8}$-in. & $\frac{3}{4}$-in.
,, 2 ..... $1\frac{1}{2}$-in. ,, 3-in.	,, 6 ..... $\frac{1}{3}$-in. ,, $\frac{1}{6}$-in.
,, 3 ..... 2-in. ,, 4-in.	,, 7 ..... $\frac{1}{4}$-in. ,, $\frac{1}{8}$-in.
,, 4 ..... $\frac{1}{2}$-in. ,, 1-in.	,, 8 ..... $\frac{1}{5}$-in. ,, $\frac{1}{10}$-in.

F. HARRIS'S PATENT RELIANCE COMPASSES AND UNIVERSAL HOLDERS FOR CRAYONS, CHALKS, PENCILS, &c., &c.

Approved by the Science and Art Department, South Kensington.
Adopted by the Birmingham and many other School Boards.

ADVANTAGES.

1. Cannot get out of Order.
2. Grips firmly.
3. Takes several sizes.
4. Takes pen, pencil and divider.
5. Is simple and strong.
6. Good needle points.
7. Protects points.



KINDS AND PRICES.

No. I. Small size for Schools, 6d.

,, II. Larger size with inch rule divided into scales of 8ths and 12ths, 1s.

,, III. For Blackboards. Grips the chalk firmly without breaking it, and can be screwed firmly to any radius, 4s.

,, IV. Chalk Holders, do., do., 1s. 6d.

,, V. Pencil & Crayon Holders, 6d.

"STUDENTS' SET" OF GEOMETRICAL MODELS.

The set consists of—

1. Model of Horizontal and Vertical Planes, with Two Oblique Planes which fit on same. The Planes being movable, Students are enabled to realise the position of the projection of Solids when drawn in one Plane, *i.e.* a sheet of drawing paper.
2. Wire Model, showing how to draw Plan, Inclination, and True Length of a Line.
3. One each, Cube, Octahedron, Pyramid, and Hexagonal Prism.

Packed in a Box, $5\frac{1}{2}$ *in. by* 4 *in. by* $1\frac{1}{2}$ *in., 6s. per set, nett.*

THE NEW BATTENED DRAWING BOARD.

Complaints have been made that ordinary Drawing Boards are sometimes found to burst their panels or clamps; but as every description of wood is liable to expand or contract according to the variable humidity of the atmosphere and in proportion to its natural power of absorption, all articles manufactured of wood, however thoroughly seasoned, are liable to be affected more or less from this cause.

"Engineers'" or "Draughtsmen's" boards are so constructed as to admit of this variation without injury to the boards themselves, but the great cost of their manufacture has prevented them hitherto from being generally adopted.

Drawing Boards have, however, recently been constructed which, while possessing all the qualifications of the "Engineer," can be sold at the same price as the "Clamped." The results attending the severe tests to which they have been subjected are thoroughly satisfactory.

The following is a list of the sizes kept in stock, and of the prices at which CHAPMAN & HALL are prepared to supply them for the use of Schools:—

DEAL BOARDS, OAK BATTENS.

s.	d.		Size.
1	6	Half Royal	17 inches by 10½
1	9	Half Imperial ...	19 „ 13½
2	6	Royal...	22 „ 17
3	9	Imperial	28 „ 19
4	9	Imperial, full size ...	31 „ 23

TEE SQUARES.

CUSSON'S BLACKBOARD TEE SQUARES, with a special arrangement for locking the Square in any position upon the board, so as to allow free use of both hands when drawing lines with the set Squares. The Tee Squares are strongly made of oak, and are used to an ordinary Blackboard.

	s.	d.
36 in. Blade	4	6 *nett.*
48 in. „	5	0 „
54 in. „	5	6 „

LARGE SET SQUARES, framed, and extra strong, for Blackboard use, 18 ins., 45° and 60°.

	s.	d.
The Pair	4	6 *nett.*

DRAWING TEE SQUARES. (Peartree.)

	s.	d.
18 in. Blade, Taper pattern .. .. .. each	1	6 *nett.*
24 in. „ „ .. .. .. „	2	0 „
30 in. „ „ .. .. .. „	2	6 „
36 in. „ „ .. .. .. „	3	0 „

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The Official Organ of the Science and Art Teachers' Association.

MONTHLY, PRICE 3D.; INCLUDING POSTAGE, 4D.

The Journal contains contributions by distinguished men; short papers by prominent teachers; leading articles; correspondence; answers to the questions set at the May examinations of the Science and Art Department, and interesting news in connection with the scientific and artistic world.

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Highly coloured, on stout paper, 3 feet 6 inches by 2 feet 6 inches. Eight Diagrams, £1 nett; on rollers and varnished, £2 nett.

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4. INCLINED PLANE, P PARALLEL TO PLANE.
5. SCREW.
6. WHEEL AND AXLE, CAPSTAN.
7. PULLEY. FIRST SYSTEM, SET OF FOUR.
8. LEVER. SAFETY-VALVE FOR STEAM BOILER.

* Models, Vases, Diagrams, &c., entered as sets, cannot be supplied singly.

MECHANICAL.

*DIAGRAMS OF THE STEAM-ENGINE.

By Professor GOODEVE and Professor SHELLEY.

Forty-one Diagrams, 52½ Sheets, on stout paper 40 inches long by 27 inches wide, highly coloured, have been designed to illustrate a course of instruction in the Steam-Engine. If framed, or mounted and varnished, the Diagrams will form an excellent series for hanging on School walls, as they are arranged to convey full information of the subject in its details. £3 nett.; varnished and mounted on rollers, £8 5s. nett.

These Diagrams can also be obtained in sections, at the under-mentioned prices nett:

			Unmounted.			Mounted.		
			£	s.	d.	£	s.	d.
Section S.A.	History of the Steam-Engine	11 diagrams	1	0	0	2	16	0
,, S.B.	Valves and Valve Motion .	13 ,,	1	0	0	2	14	0
,, S.C.	Feed Apparatus . . .	3 ,,	0	3	6	0	10	0
,, S.D.	Governors	3 ,,	0	3	6	0	10	0
,, S.E.	Expansion of Steam and Indicators . . .	6 ,,	0	7	0	0	18	0
,, S.F.	Details of Working Parts .	3 ,,	0	3	6	0	10	0
,, S.G.	Propellers	2 ,,	0	2	6	0	7	0

As follows:—

HISTORY OF THE STEAM-ENGINE.

S. a. 1. Worcester, 1683; Savery, 1698.
2. Newcomen and Cawley, 1705.
3. Compound Engine, 1763; Trevithick, 1802.
4. Watt's Single-Acting Engine.
5. Watt's Double-Acting Engine.
6. Compound Cylinder; Pumping Engine.
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2. Section of Steam Cylinder D Valve.
3. "Long D" Slide Valve; Two Forms (1 movable part).
4. Slide Valve for small Oscillating Engine and Face of Steam Ports.
5. Valve Motion of Compound Cylinder Engine, S. Lambeth Water Works (1 movable part).
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12. Cataract Valve Gear; Steam and Exhaust Valves open (2 sheets).
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S. c. 1. Feed Pump (Locomotive); Air Pump Bucket.
2. Diagram to exhibit the principles of Giffard's Injection.
3. Giffard's Injection (1 movable part).

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S. d. 1. Common Governor; Hydraulic Governor.
2. Loaded Pendulum Governor.
3. Hydro-Chronometric Governor.

EXPANSION OF STEAM AND INDICATORS.

S. e. 1. Steam Indicators.
2. Expansion of Steam.
3. Cylinder and Approximate Indicator Figures.
4. Indicator Figures—Atmospheric Engine; Simple Acting Engine.
5. Indicator Figures—Non-condensing Engine; Condensing Engine.
6. Indicator Figures—Compound Engine; Low Pressure Engine.

DETAILS OF WORKING PARTS.

S. f. 1. Connecting-Rod Ends.
2. Parallel Motion.
3. Detail of Piston of large Oscillating Engine (84 inches diameter).

PROPELLERS.

S. g. 1. Screw Propellers—Smith's; Griffith's.
2. Thrust Block for Screw Propeller.

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2. THE MUSCLES, JOINTS, AND ANIMAL MECHANICS.
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7. THE BRAIN AND NERVES.—THE ORGANS OF THE VOICE.
8. THE ORGANS OF THE SENSES. Plate I.
9. THE ORGANS OF THE SENSES. Plate II.
10. THE MICROSCOPIC STRUCTURE OF THE TEXTURES AND ORGANS. Plate I.
11. THE MICROSCOPIC STRUCTURE OF THE TEXTURES AND ORGANS. Plate II.

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7 Sheets, 12s. 6d. each; or £1 1s. each, on rollers, and varnished.

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